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ORIGINAL ARTICLES

PRESIDENT'S ADDRESS*

PACIFIC COAST SOCIETY OF ORTHODONTISTS

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WE ARE here primarily to appraise our progress and observe our accomplishments. Yet we should feel humble when we think of the numerous unsolved problems that confront us and realize that the years to come must be even fuller of accomplishments.

Through the medium of correspondence there can be a meeting of minds; but it is only by personal contact, such as our general meetings afford, that there can be a meeting of both mind and heart.

This shuffling-up process results in a thorough mixture of human beings and frequently is instrumental in eliminating old antagonisms and prejudices, a thing greatly to be desired.

ORTHODONTIC EDUCATION

In recent years the problem of orthodontic education has been given serious thought and study by leading dental educators throughout the land. Our future progress depends largely on a practical solution of this problem. There is a great need today, in our educational structure, for men of strong character and broad educational background. Are they available from within our ranks?

With the gradual increase of knowledge in all phases of professional practice there has been a noticeable trend toward higher standards in our professional schools. This is indicated by the ever increasing entrance requirements, the extension of courses and the greater interest manifested in a liberal arts and scientific education preparatory to professional studies.

A close study of recent literature on the question of what constitutes the best plan of education for the young student in dentistry, more particularly

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one who would choose to specialize, is conspicuous by the absence of one very important factor, namely, the relative value of cultural subjects in predental education.

The profession is replete with men who have outstanding ability as technicians but sadly lacking of men who, by virtue of a cultured background, have the ability to interpret what they see, analyze it thoroughly and present it to the profession in an intelligent and comprehensive manner. Are we not graduating men who can speak glibly—though ungrammatically—of certain technical procedures but who cause their dinner table partners in polite society to have mental indigestion because of their lack of any breadth of knowledge along general lines?

While it is desirable that one should succeed in life, it is equally desirable that, with or without success, in the narrow sense, one should also be able to derive the greatest possible satisfaction from life. To this end nothing can contribute more than a liberal, cultural education; to include such subjects as social and political science, economics, philosophy, etc., in addition to the regularly prescribed predental subjects.

President Eliot once said, "Education at every stage in life comprehends three processes—development of power, acquisition of knowledge, and attainment of character," and again, "The prime object of university methods of teaching is to make the individual student think and do something himself and not merely to take in and remember other people's thoughts."

We need constantly to remind ourselves that education in the fundamental sciences and in general cultural subjects is not completed in the university. As graduates we must keep right on reading and studying in order to keep step with modern progress. Those of us whose educational opportunities were limited can take new hope in the fact that facilities are offered on every hand to make up these deficiencies if we are but willing to set ourselves to the task.

Orthodontic education has been accepted as a function and duty by most of our leading universities. Our leaders and educational authorities are, however, not in agreement on many of the vexing problems embraced in the teaching of orthodontia. This is a very natural and healthy condition. There are good reasons for believing that, "when the differences of opinion, which exist today, relative to orthodontic education, are finally worked out in different universities, it will prove to be the salvation of orthodontia."

It is our duty to cooperate and lend every assistance possible, to our educational leaders, in their worthy efforts to build our educational structure on a more solid foundation. To this end I would suggest that we have a standing Committee on Orthodontic Education in order that we may coordinate this Society with other groups and individuals who are at present working in this field.

LEGISLATION

The new Arizona orthodontic law has aroused more genuine discussion than any dental law proposed in recent years in this country. This law met with considerable opposition throughout the country. It was rather hurriedly

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put over by a small group. It is prophesied by many that within a limited period the law, as it now stands, will be either revoked or greatly modified. There must be greater advances made in undergraduate and graduate orthodontic instruction in our universities before we are ready for this type of legislation.

Dental licensure now takes no note of clinical specialization, nor is it likely to do so from the initiative of legislature or of dental licensing boards. If licensure for dental specialization appears in the future, which it most certainly will if present trends indicate anything, then the initiative is likely to come from the profession or from public demand that orthodontists et al. shall not hold themselves so to be, unless in fact they so are, and are so certified.

THE AMERICAN BOARD OF ORTHODONTIA

There now exists a nongovernmental orthodontic body, sponsored by the American Society of Orthodontists and known as the American Board of Orthodontia which constitutes the most outstanding moral movement for the establishment of orthodontic standards governing qualifications for practice which has ever been inaugurated. Numerous orthodontists, of the higher type, have made application to the American Board of Orthodontia for certification, and many of these are now exhibiting certificates in their offices.

This movement must affect graduate orthodontic education quite as significantly, and as favorably, by its moral force as dental licensing boards have already affected undergraduate dental education by legal force. Furthermore, as the matter develops and as the public gradually grows to understand and to appreciate the situation, the clientele results upon special orthodontic practice will be much the same from the moral force exerted as if it were legal force.

As our universities broaden the scope of training for the undergraduate and graduate student in orthodontics and as representative orthodontic societies increase their requirements for admission, the status of the American Board of Orthodontia will be greatly strengthened and more appreciated.

THE PRESENT TREND OF ORTHODONTIC THINKING

The present trend of orthodontic thinking is being directed into many channels which have a bearing upon our particular problem. The vast importance of the biologic phases are being made manifest to us with the realization that we must look into this realm for the solution of many problems which perplex us at present.

The great increase in scientific and therapeutic knowledge has brought us to a point where our foresight and judgment, aided by more thorough methods of diagnosis, should enable us to treat cases with more effectiveness than ever before.

It is well, however, that we guard against any undesirable trend to lower the standard to be sought after in successful orthodontic treatment nor should we allow ourselves to be satisfied with a result which may be far short of the attainment of an efficient, healthy, masticating apparatus, which will endure for many years to the benefit and satisfaction of the patient.

ORTHODONTIC RESEARCH

Today we find scientific research so closely linked up with modern progress that it has seemed expedient to establish contact with well organized research laboratories as may be found in our universities.

That this contact has already been made is evidenced by the wonderful work which has been accomplished by Dr. John A. Marshall, at the University of California. As a direct development of dietary studies from the biologic aspect as well as from the financial requirements involved an opportunity was offered to determine what factors are responsible for the resorption of roots of teeth, especially those which have been subjected to orthodontic treatment.

This problem, originally sponsored by the Pacific Coast Society of Orthodontists and the Board of Research of the University of California, was later taken over in part by the American Society of Orthodontists. This work represents the largest undertaking in this type of research which has ever been engaged in. Dr. Marshall will give us, at this meeting, a summary of his findings to date.

Research is valuable only in so far as it helps us in our clinical administrations to our patients, to do better service. The laboratory workers' findings must be ultimately checked up and corroborated by us in our clinical work, before they can be accepted as of true value. It is our duty to support research work both financially and morally and further to reinforce it by research and recording the effects by statistical records in our practice.

Most of what we know today about orthodontic treatment has been the result of clinical evidence. With no thought of minimizing the importance of laboratory investigation, which must go hand in hand with clinical evidence, there is a great need in our profession today for greater clinical study of our work.

Our present methods of practice are not yet so perfect that all possible ideas and methods are already being utilized. Far from it. There are still a host of other ways and means—many, no doubt, that no one has thought of yet. That is why we need to put our imagination and what elementary methods we have at hand to work. Orthodontic research offers a big field, especially in the light of the revolutionary changes in methods of procedure which are predicted by some men, in years to come.

Are we going to sit idly by and wait until we become overwhelmed by these apparent changes or are we going to set ourselves now to the task of keeping pace with modern progress, to aid in the development of new thoughts and ideas, and thus be prepared for the more radical changes which must eventually follow in years to come? Let us at least resolve to organize and lend our support to that inquisitive and tireless group of men who are so unselfishly giving of their time and energy, serving as the advance guard, as it were, that orthodontic science and practice may be elevated to that high plane in scientific circles that it so well deserves.

A Research Committee in connection with our Society would naturally aid in keeping this important subject of research before the membership. I suggest that the Society consider such a committee. Such a committee should con-

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sist of men who are fully imbued with the importance of this work. They should be men of matured judgment and experience in order that they may readily recognize and discard when necessary, those facts or ideas which are impractical in their application.

To be efficient in its operation such a committee should consist of men whose own house is in order—men who are not in a rut; men who are absolutely sold on the idea and importance of progress.

POLICIES AND PROBLEMS WITHIN THE SOCIETY

The territory now covered by the Pacific Coast Society of Orthodontists includes the Province of British Columbia and the states of Washington, Oregon, Idaho, Nevada, California, and Arizona.

To provide greater opportunities to individual members and further to encourage and foster understanding and good will, the Society has been divided since 1922 into three sections, known as Northern, Central, and Southern Sections. These sections have their own officers and one member represented on the Board of Directors of the Society. Meetings are held quarterly. Activities of interest and importance are conveyed to the membership through the medium of a quarterly Bulletin.

I submit to you that the Pacific Coast Society of Orthodontists today represents one of the most outstanding orthodontic societies in the world with respect to its unique plan of organization.

The task of administering this extensive organization is not without its problems. The general expansion of our activities renders necessary the exercise of rare wisdom and much energy to make the machinery move smoothly, efficiently and effectively.

I should like to make a few suggestions which, of necessity, must be very brief. Suffice to say that these are not mere opinions or new ideas but come from intimate knowledge of the Society gained over several years in different positions of responsibility and trust and, in addition, from observations made as a member of the American Society of Orthodontists for the past twelve years.

My first suggestion is that you seriously consider the advisability of returning immediately to a general meeting of this Society every year. Our increase in membership demands it. The membership should be provided with greater opportunities for development.

There should also be some discussion on the wisdom of holding our meetings alternately at Portland or Seattle, San Francisco and Los Angeles. It is interesting to note that other organizations, business as well as professional, follow a similar plan for many obvious reasons. There is no better way to create and maintain interest and activity in our respective sections than to have each section, in turn, act as host at a general meeting of this Society. This plan of holding meetings would also be of great educational value in the respective cities. There are other reasons which may occur to you in due time.

I believe that one of the requirements for membership in this Society should be membership in the American Dental Association. In the near future it will be necessary further to protect our membership by requiring an appli-

cant to present a thesis, a series of case reports, or some other evidence which will more conclusively prove his fitness for admission to this Society.

Sectional orthodontic societies should be feeders for material for membership in the American Society of Orthodontists, and everything possible should be done to encourage the members to join the American Society of Orthodontists. It would be most ideal if, in addition to the above mentioned affiliations, as many of our members as possible, particularly the officers, would qualify for certification by the American Board of Orthodontia.

The success of this Society is dependent almost wholly upon its few officers. This should impress upon you the seriousness and importance of exercising great care in their selection. Positions of high honor and trust should be attained by successive steps. Experience has proved that if the president has first worked on various committees and through different offices, he will have gained such intimate experience and knowledge in the affairs of the organization to prepare him better to serve with constructive accord than otherwise. It is exceedingly important that a candidate for the office of president should have first served at least one year on the Board of Directors that he may be thoroughly conversant with the policies and methods of procedure within the board and, in a measure, acquainted with the duties connected with the office of president.

This new policy in procedure could be made effective by changing our present office of vice-president to that of president-elect. The most prominent societies in this country today have such an office; this places the suggestion out of the realm of experiment. The general membership have but little idea of the extent of the demands upon time and energy which the duties of president in this Society now impose on an officer who is sincere and unselfish in his efforts. By creating the office of president-elect many of these duties could be assigned to this officer.

It is time that the finances of our Society be put on a budget. Under such a plan the Board of Directors could ascertain exactly what amounts are available for essayists, program expenses, entertainment, general overhead, membership dues, secretary's salary, salary for editor and librarian and a definite allowance for editing the Bulletin. With our expenses thus scheduled we could operate on a more business-like basis. I suggest that we create a budget committee.

There is need for definite appointment of a standing committee on Constitution and By-Laws. I suggest the creation of such a committee.

Further to distribute labor, increase efficiency of operation, engage more members actively in the affairs of the Society and, as a means of determining existent talent, I suggest the following additional standing committees be added to our By-Laws: Program, Clinic, and Local Arrangements.

Time will not permit discussing these matters in further detail other than to suggest that the committees on Program, Clinic, and Local Arrangements be appointed by the president and the remaining committees by the Board of Directors. Committees for Research, Education, Budget, and Constitution and By-Laws should serve from three to five years to be of real service.

The comparatively recent revision of the Constitution and By-Laws, which

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was accomplished during this administration, was primarily for the purpose of bringing this document to a standard consistent with the advances made up to that time. It was deemed advisable, because of their importance, to present the suggestions, herein submitted, before a general meeting of the Society in order to provoke fuller discussion. Such suggestions as meet with your approval can be drafted in proper form by a picked committee and submitted to the membership through the Bulletin, followed by voting according to our Constitution and By-Laws.

Our present method of having a Board of Directors to take care of all business of the Society is a unique plan. Under this arrangement a great deal of business is kept off the floor of the Society at large, which allows much needed time for our scientific discussions.

As the Society grows there may be need for larger representation on the Board of Directors. This could be nicely handled by having three vice-presidents, one from each section, in addition to the president-elect. Each section would then have at least two members represented on the Board of Directors. Such an addition in numbers should aid greatly in offsetting a natural weakness in placing too much power in the hands of a few men.

BULLETIN

There are great potential possibilities in the Bulletin which this Society publishes quarterly for the benefit of its membership. It has been in existence ten years. It represents today, with one exception, the only exclusive orthodontic publication in the world.

The long existence of our Bulletin is due, in part, to the fact that it has been kept within certain limitations consistent with what the Society could afford. Also because, from its inception, it has been tied in with the activities of the Society, a feature which could be well copied by other organizations.

As members of this Society we may feel proud of having initiated our own periodical and supported it so loyally. Recent and prospective revisions to our Constitution and By-Laws will greatly strengthen our position relative to issuance of the Bulletin.

In closing I wish to thank the Board of Directors and the various committees for their whole-hearted cooperation in carrying on work of the Society and in the preparation of this program. It is also with a feeling of personal pleasure that I ascribe to Dr. Carl O. Engstrom that credit to which he is due for the great amount of work he has rendered this Society in various capacities, particularly in connection with revisions of the Constitution and By-Laws and editing of the Bulletin.

I wish to take this opportunity to express my appreciation to you, my friends and fellow members of this Society, for the great honor in being chosen as your president. I sincerely hope that my humble efforts to serve you and our Society may be accepted as an expression of appreciation for the privileges and opportunities for service which membership in this Society affords. I doubt whether it would have been possible for any president of the Pacific Coast Society of Orthodontists to have enjoyed a more harmonious term of office than your President has enjoyed and for that I am deeply grateful.

DEFICIENT DIETS AND EXPERIMENTAL MALOCCLUSION CONSIDERED FROM THE CLINICAL ASPECT*†

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THE essential point of the paper is this: In what respect and to what extent do deficient diets impede or impair the processes of bone growth in a child who is undergoing orthodontic treatment. If, in the consideration of this problem, a system of rational diagnosis and treatment can be evaluated, then the research will have an added practical value not hitherto suggested.

From one standpoint, laboratory animals and patients are alike—not all react to the same extent to treatment. Rather wide variations in results may occur. If this were not so, then biology would cease to be an experimental science and become, like physics or mathematics, an exact science. Having in mind then the marginal variation of error, what new facts have been added to the sum total which will permit reasonably correct conclusions to be drawn?

To return for a moment to the beginning: The statement was made[1] from evidence based entirely upon the interpretation of roentgenographs, that orthodontic bands under unknown conditions caused root resorption. Some agreed with this, others pointed out that other teeth besides those undergoing orthodontic treatment showed shortened roots. Furthermore these might be anatomic anomalies, or they might have resulted from a long standing local infection. Or, they might simply not exist! The appearance of shortened roots could be explained by the foreshortening due to the x-ray tube having been placed at too flat an angle in the mandible, and too steep an angle in the maxilla.

So even the clinical problem was not, and is not today, so definite and so clear cut as one would wish. As a consequence there still persists the feeling that shortened roots may not be so short as they appear to be in the roentgenograph. In spite of this relative uncertainty in diagnosis there remain numerous examples of teeth having roots of greatly shortened length. Upon careful inquiry[2] these have been found to be present, rather more frequently than otherwise, in selected orthodontic cases. The next question which arose was whether local causes alone were responsible or whether malnutrition was a factor sufficiently important to be considered.

Dietary studies previously conducted in my laboratory on both dogs and rats indicated that it is possible to produce experimentally, not only hypoplastic teeth in dogs but also lesions in rats which closely resemble dental caries, thus confirming the original work of McCollum and Simmonds. For example, when white rats are fed diets deficient or low in vitamin A, there will develop, after about a six months' interval, decalcified areas in the crowns of the molars which

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are similar to the lesions of dental caries as recognized in the clinic.[3, 4, 5] The dietary deficiencies are not so great as to deprive the animal entirely of the vitamins.* A study of the growth curves on animals of thirty to seventy weeks indicates that the restriction is sufficient to retard the growth weight to about half the normal weight. Not all the animals respond equally to this dietary program, but a sufficient number have been used to confirm and extend the observations previously reported. It has been well established that the dental tissues are not static from either the developmental or the nutritional aspect. Quite the contrary. In common with other body tissues they respond to changes in diet or to other environmental factors. Furthermore, teeth which are poorly calcified do not necessarily remain so. How else, for example, may "arrested caries" be explained except by the hypothesis that calcification or perhaps a "condensation" of dental tissues—dentin, cementum and probably enamel—may occur even after the tooth has erupted through the gum, and has become an integral part of the masticatory apparatus?

There is no doubt whatever that cementum, like bone, is a labile structure responding either to growth stimuli or to trauma. Local irritation may arise from growth processes, from infection, malnutrition, or mechanical injury. These factors will produce, in varying degrees, a series of changes in the surrounding structures which have certain points of similarity. In order, therefore, to study the various tissue reactions which occur as teeth are moved by orthodontic appliances, it is necessary to determine:

1. What histopathologic changes occur in pulp, dentin, cementum and paradentium during the normal process of *shedding deciduous teeth*?

2. What histopathologic changes occur in pulp, dentin, cementum and paradentium as a result of *infection*? In what respect do these changes differ from those observed during the normal process of shedding of deciduous teeth? It was found[6] that the sequence of events in this case was somewhat different, due, of course, to the presence of the organisms themselves and of their products.

With these facts clearly demonstrated the next part of the problem consisted in determining whether or not bone and tooth resorption could be produced experimentally, and if so, how could it be done, what factors control it, are they purely local, or both local and general? What type of mechanical force produces resorption and how may this be avoided? What differences and similarities do the three processes show? That is to say, is the histopathologic picture of normal resorption of deciduous tooth roots and the pathologic resorption in infection similar to or different from that observed in the experimental resorption by mechanical force?

These various questions are still being studied, and the results so far obtained indicate: first, that animals on a full diet suffer least from injuries of the nature above mentioned; second, that although resorption occurs, the resorbed areas are readily rebuilt after the pressure has been removed; third, that animals on *deficient* diets show a greater degree of resorption using the same appliances than do those on an adequate diet; fourth, that the resorbed

*From an analysis of these diets by McCollum, it appears, also, that these diets containing 0.35 per cent calcium and 0.51 per cent phosphorous are considered borderline, in calcium phosphorous ratio, to caries production.

areas are greater in extent and are repaired more slowly; fifth, that the active processes produced experimentally are similar to those of normal resorption of deciduous tooth roots but dissimilar to the lesions observed in infection and are therefore more nearly physiologic than pathologic.

Several other facts, also hitherto unsuspected, have been demonstrated in the histopathology of these lesions.[7] In certain teeth on which the tension was relatively mild but long continued, there was evidence that secondary tubular calcification of dentin occured on those root portions subjected to the greatest strain. In the crown of the tooth, it is a well known fact that this response of pulp to mild irritation frequently occurs, but it has not previously been recognized as a lesion which may develop in the root. The effect produced is that of an ever widening granular layer of Tomes.

Exactly the opposite result is found in roots of deciduous teeth,[8] having normal pulps, where active resorption is taking place. The fibers in the decalcified dentin matrix appear larger, as though swollen and also seem closer together than the fibers in areas where no active resorption is occurring.

The tissue reactions which the pulp exhibits under the indirect influence of deficient diets are also worthy of note. In rats, dogs and monkeys, I have demonstrated numerous calcified areas of secondary dentin developing within the pulp substance.[9] Furthermore, in developing teeth the zone of predentin instead of being regular and composed of fibers evenly placed, becomes exceedingly irregular, increases in depth and is made up of fibers which tend to bunch together like bundles of fagots. In the normal developing tooth this is not the case.[10]

At first glance the application of these laboratory findings to orthodontic practice may not at once be apparent, but perhaps a brief discussion may make the matter more exact. The first point which to me stands out most clearly is the need for exact data upon the physical condition of the patient. I am not convinced that a laboratory report upon, let us say, the serum calcium of a patient is a figure which can be interpreted without correlating with it other data obtained by a complete physical examination. The age, weight, height ratio is an index of the degree of normal development and indicates that growth is not a gradual increment of tissue; it occurs in "spurts," so to speak. Clinical and laboratory data extending over a number of years and collected in many hospitals and laboratories indicate that normal periods occur of acceleration and retardation of growth. Both Mershon and Leroy Johnson have reviewed carefully the literature in this field, and the consensus of opinion is that the most satisfactory results, from an orthodontic standpoint, may be expected during a time of active growth.

Many have had, I presume, the experience of trying, ineffectually perhaps, to interest the patient in matters pertaining to diet and good health. Both medical and dental professions have been interested in the experimental work upon which have been based certain conclusions relating to diet. Attempts have been made to apply these facts to clinical cases. That these attempts have not always been successful is no cause for chagrin. If malnutrition were the sole etiologic factor in certain types of dental pathology, including mal-

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occlusion, then one would expect that more spectacular results would be secured when corrective dietary measures are applied to typical clinical cases. However, in spite of the complexity of the etiology, advantage certainly must be taken of any corrective measures, such as an altered diet. In this connection, the work of Mellanby, in England, and of Boyd and Drain, in this country, is of outstanding importance, for they have shown that changes in tooth structure in teeth which have already erupted can be produced when diets are sufficiently corrected. With bone growth the improvements are still more striking.

Although the metabolism of calcium salts has not yet been worked out to the same degree of exactitude that has been possible in studying carbohydrates, fats or proteins, it has been shown conclusively that diet is only one factor in the process of utilization of calcium by the body.

With recognition of the need for help in this field, attempts have been made to correlate more closely the medical and dental aspects. That such a correlation is absolutely essential for the well-being of the patient needs no argument, but that the members of the dental profession have not received whole-hearted cooperation from their medical friends is basis for profound regret. Patients, of course, may object to the many tests that are necessary before the physician is in a position to recommend dietary changes. The orthodontist or dentist then is faced with this responsibility: Is he in a position to *recommend* to his patient certain changes in the diet, and to explain the necessity for these changes, or is he in a position to *prescribe* a dietary regimen?

It is difficult, in some respects, to indicate a dividing line between the practice of medicine and of dentistry. This applies particularly to systemic conditions which predispose the individual to dental caries and other lesions of the tooth, paradentium and oral mucosa. This much, however, may be said, that the dietary deficiencies are largely responsible for gross and microscopic variations in the anatomy of the teeth. Dysfunction of one tooth may be responsible for extensive changes in development of the alveolar process, changes that result in malposition of the secondary teeth. But it is possible also that the dietary factors are more important than is now admitted.

It would seem that a useful method of applying the present knowledge of dietary research would be for the dentist to secure more cordial cooperation with the patient and the physician. Unfortunately, however, there are too many instances wherein this cooperation either is not sought by the dentist, or is refused by either the patient or the physician. The latter situation deserves a free and open discussion in the hope that a solution of the problem may be reached. Until this point is attained, the dentist is thrown, so to speak, on his own resources and perforce must designate, at least in a general way, those changes in the diet which a study of the case seems to indicate. Recommendations on choice of food are frequently necessary, and may be made by the dentist without assuming any responsibility. Any further instructions should be left to the medically trained man.

Dietary *prescription* is a different matter. It is based on a careful study by the physician of many data gathered both by laboratory and by clinical methods. The interpretation of these data and their application are the duty of

the physician rather than of the dentist; but the clinical application of these facts becomes the joint duty of dentist and physician.

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DISCUSSION

Dr. Nina Simmonds Estill.—I do not know just how to discuss Dr. Marshall's paper, so I thought I would give you a sort of general discussion of nutrition, especially from the calcium and phosphorus metabolism standpoint—as Dr. McCollum and Dr. Kruse and Dr. Klein have recently written this paper, and Dr. Lewis had it and Dr. Marshall very kindly loaned it to me last evening—because it sums up in a very fine way just what is now known or thought to be known about the calcium and phosphorus metabolism.

Before I do that, I want to make a few statements about the problem that you meet in experimental work trying to produce caries. The stock diet that we used in the laboratory for many years gave, for example, very good growth—not optimum growth, but a very good growth. It was an inexpensive diet; that was why we used it. It favored high percentage of fertility and high percentage of nursing of the young. Mortality was very low. Now that very diet did not produce perfect teeth by any manner or means. By the time those animals were fourteen, sixteen months old—we discarded them at about seventeen months—there were very many carious regions in those rats' teeth.

Now that diet was not a diet which would give life or death, so to speak, but it gave growth, fertility, and nursing of young, but still was not good enough to keep the animals in a good condition from a dental standpoint. That is one of the reasons why the production of dental caries has been a rather difficult problem, because the animals live fairly well and grow fairly well. This is not true of the vitamin deficient diets. You have sharper contrasts there. If cod liver oil had been added to this diet, the condition would have been very different.

The problem you meet in planning a stock diet is this: You must have the stock diet of such a nature that it will make the experimental animals usable for experimental work. If the stock diet had been perfect, so to speak (this diet would have been much better if cod liver oil had been added), you could never have produced rickets in those rats. So you see the problem which one faces in handling a stock diet. The diet must be good enough to have high fertility, rearing of young, and so forth, but not good enough to keep the animals from developing the deficiencies and diseases and other conditions when you put them on experimental diets.

If you gave them cod liver oil, you would have a great tendency for xerophthalmia, because of the storage of vitamin A in the liver.

So in regard to the problem of which Dr. Marshall has spoken, of producing caries in animals, those of you who have not had to do it do not know how many problems are

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involved. Theoretically, you must have very good animals, of course, for experimental work, but they must be in a usuable condition.

This same factor is probably involved in the nutrition work with our children and our own nutrition. It has been found in a number of cases that children who were making very satisfactory growth, apparently looking all right, would really gain more if they were given an egg once a day, not that they really needed it, so to speak, but they would be in better condition, more optimum condition, if they were given that. That is a factor which is not generally appreciated.

The conditions which were outlined in Dr. Marshall's paper apply to human beings and might be responsible for those of us who are on a satisfactory diet—I mean the general average run of diets. Now whether those diets are what we call, from the experimental standpoint, first-class diets is an open question. We eat meat, bread, potatoes, pie, and coffee, and feel very well fed. Our stomachs are full, but that is not what one would call a highly satisfactory diet.

Because of the long span of human life—we do not know about monkeys, but the life span of rats is not more than three years—the rats show deficiencies much sooner than human beings. Because of this longer period of growth and longer span of life, Dr. Bloch, in Copenhagen, recently published a paper showing that vitamin A was probably not a factor in regard to faulty teeth.

These children were in an orphanage in Copenhagen, and they had had xerophthalmia as babies. You know, Denmark is a great dairy country, but the price of butter was always high, so the butter was sold and the children had none, and developed xerophthalmia. These children are now twelve, fourteen, sixteen years of age, and Dr. Bloch had them examined. The teeth were not bad. He could not say that the lack of vitamin A—and a lack sufficient to produce blindness—had really played any part in the condition of the permanent teeth. That paper is in the *American Journal of Diseases for Children* in the last August number.

Those children were given cod liver oil, after the blindness had resulted, the reason for giving it then was that fifteen or sixteen years ago it was not generally known that vitamin A was the cause of xerophthalmia. So you have a pretty good experimental demonstration carried on in quite a number of children and dealing with the effect of the lack of vitamin A on teeth.

The reason why the experiment is rather good is that in the case of the children of Copenhagen in orphanages, from the ages of eight to sixteen or seventeen, the government has control of the diet during those years, so Bloch had a rather good place to observe there.

Dietary studies are complicated also because man and guinea pigs and rats and monkeys are all different. In regard to the problem of vitamin C, which Dr. Marshall did not mention except in the guinea pigs, the guinea pigs are very, very susceptible to lack of vitamin C, and thus develop scurvy. Man is not quite so susceptible, and the rat is apparently immune, so that has complicated much of the experimental work which has been carried out on guinea pigs and some of the clinical work which has been published quite recently.

Dr. Marshall points out that there was a greater degree of resorption on deficient diets than on adequate diets, when the appliances were used. Now malnutrition in human beings, if these appliances were used on children, may be a very different thing from what it may be in an experimental animal, because malnutrition appears to be painless. We have these children who are poorly nourished, underweight, stoop shouldered, eyes not well—not xerophthalmia. They are little tired children, the little tired old men and old ladies. Well, children of that type are not ill in a sense of being ill, except that they are just as ill as if they were ill, but are merely poorly nourished. Now as to whether those children do not show greater resorption, you see it is a different problem. The problem of malnutrition is the outstanding problem in human dietaries—not the deficiencies, because so many people have just forgotten what it was or what it is to feel perfectly normal. They are contented with feeling overfatigued and overtired and that type of thing. Now that is not really the normal human being.

If we had the same condition in experimental animals, we should discard them. If we had many experimental animals like the human beings we see running around, we should discard them. But of course in human beings there is a different situation. Whether the

body functions as well in chronic fatigue is an open question. That is probably out of place here, but it is a contingency which is ruled out in animals.

Certain primitive men are said to have had very good teeth. Dr. Catlin in 1861 described the skulls of the Sioux Indians and found the teeth were very good. The skulls of inhabitants of the northern part of Greenland also were good. Now if you examine what is known about the diet of those individuals, you will find that it was a high phosphorus diet, mostly a meat diet—not muscle, but blood and liver and kidneys, and so forth. We often think of meat diets as only muscle. We should think of a carniverous diet as blood, tissue, bones, everything put together. There was nothing about the primitive man's diet which is mysterious when we know the dietary factors of the foods involved.

The seed eating Indians of the Southwest have an entirely different type of teeth. They have many more cavities than the carniverous types of the middle plains and the regions around San Francisco.

Whether heredity does play a part, as Dr. Pullen suggested, or not—that is a factor, of course, which many geneticists do think does play a part, not only in tooth problems but in rickets, bone conditions—not as such, but just simply inheriting a poor body structure. No one can give a positive answer about that, but if we go back to animal husbandry, we all know that we cannot make a perfect animal out of a scrub one. Everybody knows that. The people long ago knew that by selective breeding they would have better animals for beef as well as for milk production. Good food did not make a good animal. This had to come through selected breeding as well. Now whether that is true in human beings, we do not know, but the work which is being done on rickets at the present time, the widespread interest in rickets, I think may give in the long run a rather good answer to that.

If physicians find, for example, that they have many children developing rickets regardless of what they do—and some physicians have made such a statement, that they can give cod liver oil, and this youngster will still have rickets—whether those numbers are large enough or will be large enough in the course of a few years to make any statement in regard to heredity, will, of course, be of interest, but we cannot say at the present time whether the same thing holds true of teeth.

I do not know whether poor teeth run in families, but there is a factor there which I think may not be appreciated. They used to reason that rickets was inherited. You have food habits, food likes and dislikes, traced through families very closely, unless the children have gotten away from those later on; but I think it is more or less perhaps food likes and dislikes, which are not inherited, of course, but are carried from mother to child, rather, always being something which is inheritable.

Erdheim took out the parathyroids and found that the teeth decayed very rapidly. Whether or not the parathyroids enter into the problem of tooth decay, of course, is an open question. There are dentists, I know, who feel that the ductless glands have a very large part in dental caries. I do not know. That is something which will be answered more or less in the next few years.

Now the paper of Dr. McCollum, which Dr. Marshall spoke of, is a very interesting paper. For quite some time, the question has been asked as to what factors are involved in dental caries, and also whether the poor calcification is synonymous with dental caries. But from what I gather from a rather hasty reading of the paper last evening, there has been quite a bit of confusion in the minds of many people as to what the poor calcification means as compared with the real dental caries. To make the discussion rather short, they have put forth the hypothesis and have analyzed a great many data in light of their hypothesis, and it all holds true so far. Now this is in the rat. Whether it applies to the human being is another question.

Dental caries is due to a low phosphorus content of the blood, which, of course, may have its origin in a low phosphorus content diet. The very reasonable hypothesis is presented that such a diet fails to meet adequately the phosphorus requirements of the body, including, of course, the saliva. Naturally there are several aspects of the problem which require further investigation, and time does not permit of a more thorough discussion.

But I want to mention some work done by Dr. Scholl, because of some very important

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observations. Years ago, we were taught that if you took a diet very high in calcium, the excess calcium would be excreted in the feces. That apparently is not true. If a diet very high in calcium is given, a certain amount of phosphorus is also taken from the body. We knew that you could injure an animal by giving it a high calcium diet, away back in the ricket stage—in 1911. We knew that if you fed a rat 0.03 per cent of calcium on a low phosphorus diet, you would ruin him. We thought it was an excess of calcium. We did not know why. But Dr. Scholl's work indicates that when you feed a very high calcium diet, there is phosphorus lost from the system as well, which is excreted, so that by giving a high calcium diet you injure the animal unless you give it an amount of vitamin D.

The three factors, calcium, phosphorus, and vitamin D, apparently hold for good tooth formation as well as for good bone formation.

McCollum et al. have also discussed the factor of the calcium and phosphorus content of saliva, which is a very important thing, I should think. They believe that the calcium phosphorus content of the serum is shown also in the calcium phosphorus content of the saliva, and so if you have a diet either high in calcium or low in phosphorus, or the other way around, and a small vitamin D content, you have not the conditions present for the utilization of calcium and phosphorus. It is quite a complex story, so I do not expect to give it all to you this afternoon. The paper is about forty pages long. It will be published within a short time, I expect, and it is well worth any one's careful study.

But the point which is not clear, and of course which no one can answer at the present time, is this, just what is the relation between a normal phosphorus and normal calcium content—and what is a normal calcium and phosphorus content, especially phosphorus?—what relation does that have to the dental caries in human beings? I think the question that is going to be asked is, do the children who have rickets—and this is where the dentist will be able to give some very good information—do the children who have rickets also have dental caries, and a lot of dental caries? Now a number of years ago, they did not think that was so. Some children with severe rickets did not have dental caries. Just where the theory, or rather, the hypothesis of Dr. McCollum and Dr. Kruse will apply in those instances cannot be foreseen until more data are available. We shall need the cooperation of the dentists and physicians, because they are the ones who will see these particular patients.

But apparently a diet high in phosphorus—now whether that be meat, beans—and what are phosphorus?—especially meats, phosphorus containing meat, and milk of course. You have calcium. You have got to have a generous amount of all these things. There will simply have to be more work done on it and more dietary studies made, on children with malocclusions. But dietary histories are one of the most difficult things to secure, as anybody who tries to secure them knows.

We cannot make any positive statements about just what factors or rather what foods are essential in a diet, because we have to remember that while we use milk, butter and eggs, and so forth, there are people throughout the world who have not used those materials and who still have had very good teeth. I remember one student at school from Korea. He came from one of the poor families in Korea, and they had never had very many luxuries—what we call necessities; he called them luxuries—but he had beautiful teeth, beautifully spaced, beautiful teeth. He had never used a tooth brush, either, until he got one at school, but he always used salt on his finger. They lived very simply, but adequately. He had not had an abundance of milk. They had a great amount of vegetables. He probably got the calcium and phosphorus from the vegetables.

There are many climatic factors. That is being talked about now, because attention has been called to the fact that you do not always get the same results under the same conditions.

Dr. Steinboch—this is digressing a little, but it illustrates the point I want to make—in his work in Wisconsin, insists that you need copper, as well as iron. He has been working on anemia in rats. Dr. Lewis, in Cincinnati, insists that you do not. Now they are both very excellent workers. They have changed the different rats they have used in their laboratories, but one gets one result and one gets another. The rats are the same. Now there are certain factors which we as yet do not understand in diet, and you see we have to recognize them.

I want to read a statement from Dr. J. Lawson Dick's book on rickets. It refers to the work of another doctor.

"According to the chief changes which occur in the bones of the face found in the superior maxilla, he says that there are two relationships of this bone which are of primary importance in the production of these deformities—the association of the teeth, and the function of mastication, and the relationship of the nose and ear passages to the function of respiration."

In 1896 Dr. Marchand of Paris stated his belief that the coexisting adenoids and rickets were the chief factors in the production of the high arched palate which is the most characteristic deformation of the superior maxilla. In 1907 Dr. Marchand also stated his belief that rickets was a true cause of the high palatine arch.

Anthropologists at the Smithsonian Institute in Washington have talked a great deal about changes in the form of the skull in the last three or four hundred years. Whether that is due to the more refined foods which we are using, or whether it is due just to a progression, or rather, abrasive progression, I do not know. But Dr. Arthur Kett believes that deformation of the palate is associated with a failure of the function of the jaws as a grinding machine, leading to defective growth in the bones. He points out that the shape of the skull has changed markedly since the Roman period, the high, arched palate, and the irregular and crowded teeth. Now we see in a malnourished child the deepening of the orbits to a lower angle, when the orbits are pulled downward and outward, and the lowering of the entrance of the nose by lowering of the nasal orifice and thickening of the nasal bones which are somewhat more prominent that normal. Dr. Kett believes this is due to the change in the modern habits of living. Some of the foods require little mastication, and in place of the rough, coarse, grainy food, we have softer foods.

Now, is coarse food necessary? Is not that merely to say that we need the coarse grain foods, when what we really need are certain dietary factors, and whether you take soft foods or hard—maybe you will all disagree; I do not know—if you have certain dietary factors in the diet, is not that the important point, rather than the continual grinding?

Dr. Albert H. Ketcham.—I should like to throw a little light on this work of John Marshall's. This work was started in response to a query concerning the resorption of the roots of permanent teeth under orthodontic treatment.

I shall just correct a little discussion this morning. The first fifteen hundred dollars to finance this research was donated voluntarily by members of the Pacific Coast Society of Orthodontists. The University of California donated eight hundred dollars. Eastern orthodontists subscribed another fifteen hundred dollars. This was to start the first years' work.

A large part of the fifteen hundred dollars subscribed in the East was returned to the original subscribers by the American Society of Orthodontists. There were two or three who refused to accept the return of their money, claiming that it was a donation which they had given, and they would not accept a refund. The money donated by the Pacific Coast Society of Orthodontists was not returned by the American Society, for the reason that the American Society of Orthodontists was well aware that the men in the Pacific Coast—and especially those in California—did not need the money.

Now first I had better discuss what has been done with this money. I should say in brief that a total of $15,037.50 has been subscribed. After the first year, at the next annual meeting of the American Society of Orthodontists, the Society voted to assess its members—those residing on the Pacific Coast as well as those in other parts of the country—$10 per year for each member, to raise funds for research. In addition to this $15,037.50 which has been spent in this work, the University of California has donated $3,200.

I am pleased to announce that Dr. Marshall informs me that it will be unnecessary to have an assessment of the members of the American Society of Orthodontists this coming school year; that is, 1932 and 1933. Funds are available to carry it on for another year without an assessment. Doctor Marshall's work in studying the material at hand will quite likely take more than another year.

The total number of monkeys used in this experiment is twenty-two. Of these twenty-two, seven were not bought by the fund secured from us poor hard laboring orthodontists, but

were donated by the Hooper Foundation of the University of California Research Department for the orthodontic research.

Of the twenty-two monkeys, eleven were on full diet and eleven on restricted diet. The total number of monkeys having had appliances on their teeth were fifteen. There were two other monkeys having separating ligatures between their teeth. The total number of monkeys saved without appliances were five.

Now to give you just a glimpse of the vast amount of work necessary in studying this problem. Eight monkeys have been dissected and prepared for study. Of these, the sections of the heads of four monkeys have been sectioned, studied and reported. A total of about eighty-five hundred microscopic slides have been prepared from these eight monkeys, and by the time the heads have been prepared for study of the balance of six—fourteen monkeys—you will see that there will be a tremendous number of slides.

There are three monkeys still alive, and these have all been on restricted diet. The teeth of two of these monkeys have been moved and then given a period of rest, and they will be moved again.

Dr. Marshall has given his time without any recompense, and he has been obliged to do this work outside his very full teaching course, so it means that he devotes holidays, Sundays, and nights to the study of this problem and interpretation of these slides; and from what you have seen on the screen you see that they are very beautiful slides. Now enough for that.

The results, as you have grasped from Doctor Marshall's paper, the practical results of moving teeth are, first, the four monkeys on deficient diet which we studied whose teeth were moved by orthodontic appliances showed changes in the roots and supporting tissues of the teeth, more rapidly and to greater extent than the monkeys on a full diet.

Also they showed that with the same amount of pressure, the roots resorbed. When the pressure was discontinued, reparative changes did not take place nearly so rapidly nor readily as was the case of the teeth of the monkeys on a full diet.

It really does make a great difference in the cases of our orthodontic patients whether we have repair or not. The rebuilding of new tissue restores in part both tooth root and attachment.

When I first brought up this subject and reported resorptions, I was severely criticized by some orthodontists, who said that Ketcham ruined the practice of orthodontia through showing that damage may be done to tooth roots.

I did it for two reasons. One was that I was sorely troubled by the problem. Faced with the fact, it seemed that throwing light upon this subject might help meet the problem. The second was that dentists are surely going to make x-ray pictures of your patients and my patients later on, after they leave our hands, and in discovering short tooth roots the dentist is sometimes thrown into a panic and transmits this panic to the patient. If the dentist has knowledge, if we have transmitted the knowledge of actual conditions to the dentist, he will be prepared in his mind to accept the situation with some degree of common sense.

Oppenheim sent me a paper published in the German language, which I had translated, and that paper was really a criticism of my first two papers on this problem. In that paper he expressed the opinion that deficient diets did not play a part in root resorptions, but that resorption was probably due to faulty technics. He reiterated the advantages of light pressure in moving teeth. He also had a great deal of fun with the suggestion which I made, in closing the discussion of one of those papers. He made the statement to the effect that if an orthodontist had a patient with a condemned tooth, it might be well for the orthodontist to move that tooth for a certain period of time under the advice of a man like Dr. Marshall, keeping careful record of pressure applied, the nature of the pressure, physical conditions of the patient, diet, everything; and then later on have the oral surgeon remove the tooth with as much supporting structures of the tooth as possible, and then turn it over to Dr. Marshall for study.

Oppenheim, in closing, after finishing his fun with this statement, said that at least we should have the advantage of being more economical, or of using less monkeys.

There is a young orthodontist in Chicago by the name of Herzberg who has done

that very thing. He had a patient, a girl eighteen years of age. He sent me a copy of his paper which he read at the Chicago midwinter reading. He decided that the maxillary first premolar should be extracted in that case, to facilitate orthodontic treatment. So he banded one of the maxillary first premolars and moved it through the means of intermaxillary ligatures, having no other part of an appliance upon the maxillary teeth. But the intermaxillary ligature crossed to the mandibular tooth on the opposite side. He moved this tooth for seventy days. He moved it about 2 mm., I believe. Then both first maxillary premolars were removed with as much of the supporting tissue as possible, the buccal plates coming away intact, but the lingual plate—which is the most important, because it was on the side of compression as you move the premolar lingually—was macerated, so that it could not be used.

Then in the research department at Chicago the tooth was examined and the slides were made and studied. The report was that the rearrangement of the bone was the same as Oppenheim had found in the case of the monkeys which he had under experiment a number of years ago. So it would appear that these experiments upon the monkeys are comparable to those upon human beings.

Now I am not going to waste your time. There is just one point that I had better speak of, perhaps, and that is the dentist or the orthodontist prescribing a diet. I am quite closely associated in research work in Denver with men in different lines of medical specialties, and with pediatricians. They admit—that is, the men in the medical profession outside of the pediatricians—admit that pediatricians are the only ones who know anything about diet as a general rule. I believe that when you see a child quite poorly nourished and quite evidently something is at fault, that you should refer that child to the pediatrician, and put it under his care. But in the case of the average run of patients, if the orthodontist cannot learn as much about what constitutes a rational diet as the pediatrician, then he certainly must be dumb. He can do it very readily, and there is no excuse for not knowing. We should know first of all that some children are suffering from faulty metabolism. They do not assimilate, do not make use of good food or food in the right proportions. Then we know that there are some foods grown on certain lands which are deficient in the elements which they should possess. For instance, I just had a letter from a bacteriologist from the Bacteriology Department at the Agricultural College in Colorado, and he sent me reprints of papers in regard to testing soils for their mineral contents through bacteriologic growth. He wrote that from 75 to 80 per cent of the cultivated lands in Colorado are deficient in phosphates.

With this background, knowing that the child may be unable to assimilate a good diet, he should be referred to the pediatrician.

There is a general rule which the research men have shown us. It is essential to have vitamins, and that vitamins are contained first of all in tomato juice and cod liver oil. And if you have not good tomato juice and cod liver oil, then use orange juice. But you do need vitamins, raw fruits, and raw vegetables. Impress that upon your patients' mothers—raw fruits and vegetables, every meal if possible. Then, too, they should have milk. They should have a quart of milk a day. Now that may be too much for some of them; they may suffer from anemia, but take an average of a quart of milk a day. And then, instead of white bread, whole wheat bread. Then, food lacking carbohydrates. They love to sweeten starchy desserts. And suggest fruit jellos, raisins, figs, and dates, custards if they are not sweetened, in place of rich, starchy desserts.

It is a very good plan with a child, especially the girls of high school age, to question them. Oh, they have a good diet! They eat fruits; they drink milk, and all of that! But do they? You will find that they do not if you question them.

"What did you have for breakfast?"

"Well, I'm in a hurry to get to school after breakfast, and I have a cup of cocoa and a piece of toast."

"Well, what kind of toast?"

"Well, white bread."

"What do you have on it?"

"Jam, or orange marmalade."

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Then suggest a rational breakfast, orange juice, egg, a little rasher of bacon, and a glass of milk, and if they use cooked breakfast foods, keep the sugar off them, or down to the minimum.

And the same way with lunch. They rush out and get an ice cream cone and a white bread sandwich with a little meat, perhaps, or jam, instead of choosing a vegetable or a fruit salad, whole wheat bread, some of the dairy products, cheese and lettuce. And then they finish up with an apple or banana.

Then you will find that they make dinner at night the heavy meal of the day, and when they are tired out, and they will have meat and potatoes—which are all right—and hot biscuits, and a heavy dessert.

Dr. John A. Marshall.—I should have said in discussing those slides that a few of them were prepared from the dogs sent to me from Dr. Scholl of Yale. Those are the animals that showed very marked areas of hypoplasia in the dentin and predentin.

Just one word about etiology. We have the A, B, C, D, and E of etiology. They are: Anatomic, Bacteriologic, Chemical, Dietary, and Endocrine. Those are the five factors we have to consider, I think, in dental pathology, of course to a less extent in orthodontia, but we certainly have to consider them when we are talking about dental caries.

Now Dr. Ketcham made the suggestion that teeth be extracted with the surrounding tissues and sent to me. I do not know just how generous your patients are. I should not want to give any of my tissue. That is the principal objection I have to this paper of Herzberg. In extracting this premolar he took off a small part of the buccal plate—none of the lingual. That was the most important. While I think this suggestion is interesting, unless you can secure from your patients a good quarter of an inch of tissue around that tooth, I do not want it, because I cannot use it.

Another thing, you said to record the pressures. How are you going to do that when you do not measure them?

I think the next big step in orthodontic reasearch is going to be from the standpoint of measuring the physical properties of spring tempered wires. What happens after soldering and bending? Have you found the "fatigue" of that wire? So far as the physical and chemical changes are concerned, you do not know anything about it. You guess that that is enough pressure. And perhaps you check it up by asking the patient the next day if the tooth is sore! In experimental work the counterpart of that check-up is careful and continuous observation.

ETHICS AND BUSINESS PRACTICE IN ORTHODONTIA*

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Ethics: 1. A treatise on morals.
2. The science of moral duty . . . . .
the science of the ideal human character.
3. Moral principles, quality or practice;
a system of moral principles.
—Webster.

IT HAS seemed to me that orthodontists might find it both interesting and helpful to give some serious thought to the subject of professional ethics. We may recall having heard a lecture or two on the subject during our college course. Possibly we remember some discussion in the dental society relative to calling one of its members "on the carpet" for an alleged infraction of the section of the Code dealing with advertising. Most of us have been members of the dental profession for a number of years and feel that we have learned long since how to deport ourselves professionally. Accordingly we may not see any advantage in consulting the "rules and regulations." However, it will be found that even a casual survey of the subject of ethics will prove of keen interest and practical application.

I am indebted to Dr. Arthur R. McDowell, Dean of the College of Physicians and Surgeons in San Francisco, for some interesting observations on the subject of ethics, particularly his reference to the famous code of Dr. Thomas Percival (of England), dedicated to his son, a medical student, from which the following quotation is taken: "The relations in which a physician stands to his patients, to his brethren, and to the public, are complicated and multifarious, involving much knowledge of human nature and extensive moral duties. The study of professional ethics, therefore, cannot fail to invigorate and enlarge your understanding, while the observance of the duties which they enjoin will soften your manners, expand your affections, and form you to that propriety and dignity of conduct which are essential to the character of a gentleman."

With Dr. McDowell's permission, I cite the following works, all of which he suggests as helpful reading in conjunction with his course on Dental Ethics given at the College of Physicians and Surgeons: *An Introduction to Ethics* by G. A. Johnson; *The Elements of Ethics* by J. H. Muirhead; *Ethics and Jurisprudence for Dentists* by Edmund Noyes; *Ethics* by B. Spinoza. And in case one becomes enthusiastic over the subject one may include: *Reconstruction in Philosophy* by John Dewey; *Why We Behave Like Human Beings* by Will Durant; *Critique of Pure Reason* by Immanuel Kant; *Essay on the Human Understanding* by John Locke; *First Principles* by Herbert Spencer; the Works of Aristotle, Plato, Nietzsche, Schopenhauer, Hume, Bacon, etc.

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But to proceed, the Code of Ethics of the American Dental Association makes most interesting reading. I shall not embarrass you by asking how many present have read it during the past five years, or in fact have ever read it.

The first section of this Code admonishes that the "Golden Rule shall be conscientiously applied by every member of the Association."

"*Section 2.* As an inducement to patronage in the practice of dentistry, it is unethical and unprofessional for a dentist to employ, or permit the employment of letters, handbills, posters, circulars, cards, signs, stereopticon slides, motion pictures, telephones, radio, newspapers, or any kind of printed or written publication, or any other device or means for the purpose of

(1) Advertising personal superiority or ability to perform services in a superior manner.

(2) Advertising definite fixed fees, which in the nature of the professional service rendered must be variable.

(3) Advertising statements that might be calculated to deceive or mislead the public.

(4) Advertising under the name of a corporation, company, association, parlor or trade name.

(5) Advertising special method of practice or peculiar styles of service.

(6) Advertising reports of cases or certificates to the public.

(7) Employing, associating with or making use of advertising solicitors or free publicity press agents.

(8) Guaranteeing or warranting operations."

Do all of us observe the spirit of these requirements? From time to time we learn that certain men in our ranks are emphasizing to the public—at least to their consulters—the vital importance of using appliances of a particular type. In a recent instance of the kind it was said the orthodontist insisted that unless the favored appliances were used in the case being discussed, little or no hope of success might be anticipated. In another instance which came under my own observation it was reported the orthodontist who had been consulted had stated the desired results would be guaranteed.

An unfortunate tendency, too often indulged, is that of promising too much in the matter of results to be obtained from orthodontic treatment. Causes of malocclusion are so obscure in many instances that guesswork takes the place of knowledge. Habits as a causative factor—even when detected—are not readily cured. Why then make unconditional promises of a satisfactory termination of treatment?

"*Split Fees, Commissions, etc.*"

"*Section 6.* It is unethical for dentists to pay or accept commissions, in any form or manner on fees for professional services, radiograms, prescriptions, or on other services or articles supplied to patients. This Association discourages the custom of the dentist selling to patients mouth washes, dentifrices, tooth brushes, or other materials or articles."

The matter of paying commissions in orthodontia had a wide discussion a few years ago, and most of us had believed until comparatively recently that

the practice had ceased. However, it appears this unethical practice still persists in some quarters. The American Society of Orthodontists has prescribed that its practice is sufficient reason for disbarment from the Society. Likewise the American Board of Orthodontia will have none of it.

A matter having an interest incidental to the foregoing is the custom, more or less prevalent, whereby the orthodontist tenders his professional services to the families of physicians or dentists, purely on the basis of professional courtesy. In a recent issue of *Oral Hygiene* a dentist recites his experiences in rendering his professional services to the family of a physician. A large amount of work was performed and a bill rendered. The charge came as a complete surprise to the physician who had supposed that any obligation he had incurred would be disposed of under the fairly elastic consideration of a "professional courtesy." The dentist thereupon explained in a lengthy communication just what the complicated services had meant in point of time, expense and energy. The explanation was accepted by the physician, with the statement that he simply had not understood.

When it is considered that rarely would it be possible for the dentist or physician to make a like return of service, either in point of time expended or in dollars and cents value, the question arises, just what is the motive in this procedure? If it is merely a bid for patronage, there opens up the question, how nearly does its practice approximate an infraction of Section 6 just quoted?

"*Unjust Criticism: Section 7.* One dentist should not disparage the services of another to patients. Criticisms of operations which apparently are defective may be unjust through lack of knowledge of the conditions under which they were performed. However, the welfare of the patient is paramount to every other consideration, and should be conserved to the utmost of the practitioner's ability. If he finds indisputable evidence that a patient is suffering from previous faulty treatment, it is his duty to institute correct treatment, at once, doing it with as little comment as possible and in such a manner as to avoid reflection on his predecessor."

It is obvious, of course, that the main thought of the writer of this section of the Code of Ethics had in mind operative dentistry, and that he was not thinking of orthodontic procedures. However, the first part of the section relating to criticism of the work of others is entirely apropos. There is probably no work in all the realm of dentistry where more care needs to be observed in criticizing others than in orthodontia. In fact, I often think, about the only standpoint from which to judge a given result in orthodontia would be the ability to treat successfully the same case yourself; there are many reasons, aside from inexperience or inability of the operator, why a given case may come out badly, or with only a fairly good result. On the face of things it may appear that the specialist has not used ordinary good judgment or skill, but little may one be able to visualize all of the contingencies of the particular case in question.

A recent editorial in THE INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY dealt with the tendency of dentists to criticize the

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fees of orthodontists. Of course this habit is based on ignorance of the work of the orthodontist. It is unfair and unethical and has scarcely any justification in fact.

Section 11 refers again to the matter of guaranteeing results and promising superior methods of treatment, etc., in the following words:

"It is also unethical to promise radical cures or to boast of secret methods of treatment, secret remedies and cures, or to exhibit certificates of skill or of success in the treatment of disease, or to employ any other questionable method to gain the attention of the public for the purpose of obtaining patronage. It is the duty of the dentist to warn the public against these dishonest methods . . . . ."

CONSULTATION IN ORTHODONTIA

It is the function of the orthodontist to diagnose conditions of malocclusion that may present to him for treatment. The superficial manner in which this service is rendered by many specialists does not augur well for the future of our work.

The common procedure is for a mother to start on a "shopping tour" among the various orthodontists of the community with a view to obtaining the lowest bid for correcting the malocclusion of her child's teeth. Usually the mother has been delegated to this task by her husband who does not consider the subject sufficiently important to engage his attention.

These orthodontic shoppers offer opportunities to the specialist for some much needed educational work. Unfortunately this is too often neglected, and the shopper is encouraged in her already inadequate estimate of the value of the service she is seeking.

Even the carpenter and plumber require time to study plans and specification before entering "bids" for their work. How much more important that the orthodontist dealing with the correction of human deformities take time to study a case presented before committing himself as to methods of treatment and compensation therefor!

What should be the minimum requirement in an orthodontic consultation? Certainly impressions should be secured from which good casts can be made. And no man who styles himself an orthodontist should undertake to treat a case until he has secured adequate radiographic records of the dentures he proposes to work upon.

Therefore the inquirer should be definitely told that until the foregoing steps have been taken, no idea can be given as to a proper fee for the work contemplated, that to hazard a guess at this juncture would be as unfair to the parent as to the othodontist. This position is wholly justified by any orthodontist who values his reputation as an enlightened practitioner.

With good casts and radiograms in hand, together with such other essential data as has been obtained, the practitioner can make a fairly intelligent study of the case. Then, and not until then is he in a position to arrive at the requirements of treatment and state a fee that will be fair to everybody concerned. He may then arrange a second appointment for further discussion of the case. It is highly important that both parents be present on this occasion.

This method will tend to bring into the orthodontist's practice the children of those who appreciate carefully rendered services and are willing to compensate fairly for them. Consulters who will not accede to this procedure should be allowed to continue their "cash and carry" system of shopping about for the lowest price the community will afford. But as orthodontists awaken to the responsibility their work entails and to the dignity of their calling there will be less eagerness to "land" cases regardless of all ethical consideration. Those parents who make the fee the prime consideration in engaging the services of an orthodontist not only manifest ignorance of the requirements of orthodontic treatment, but at the same time pay a doubtful compliment to the specialist himself.

As to a consultation fee, a consultation worthy the name involves considerable time, effort and office expense on the part of the orthodontist, for which a suitable charge should be made. Opinions and fees based upon snap judgment are hazardous. Here again is opportunity for educating the public as well as the dental profession.

Fear of losing the case should not hinder following the comprehensive course suggested. The sooner all reputable orthodontists get a vision of what properly constitutes orthodontic treatment and are ready to take a stand for better methods of office practice and higher ethical considerations, the easier it will be for all to maintain a proper standard of business procedure. To the degree we awaken to our common responsibility, to that extent may all reach an equal footing in these matters.

It will be wholesome for the practitioner whether young or old in the work to think less of competition and more of rendering good, honest, scientific service. This will go far toward establishing one's place in the confidence of the public one seeks to serve.

DISCUSSION

Dr. James D. McCoy.—Our essayist has presented a subject of outstanding importance to our specialty, under the title of "Ethics and Business Practice in Orthodontia." If I should amend his subject in any way, I would put it as follows: "Ethics and *Good* Business Practice," for I believe that no truly successful practice is conducted minus the best ethical principles.

Those of us who have been deeply concerned with our specialty through a long series of years, go through periods of discouragement because we feel that we are not advancing as rapidly along some lines as we should. Perhaps we should not suffer these depressing periods, but rather put down the conditions which we do not approve of as being the "growing pains" through which orthodontia is passing in its growth and development.

One of the most important factors essential to the moral tone of any profession is the daily practice of a high order of inter-professional relationships. We call this "ethics," but in the last analysis it is nothing more or less than playing the game according to the rules of fair play. These rules are most simple, for they only require that we always treat the other fellow just as we should like to be treated under similar circumstances. There are many opportunities for applying the principles of fair play, and only a few will be mentioned in this discussion.

The orthodontist is placed in the same position as any other specialist, in that he is handling cases where there is a division of responsibility, viz., that carried by the general practitioner and by the orthodontist. We should be most careful and tactful and should

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require the same consideration of others to the end that we be allowed to serve our patients unhampered by preconceived ideas or premises laid down by some other practitioner. The decision as to diagnosis and methods of treatment should rest with the one who must carry the case to completion, for he must bear by far the major responsibility. Not only does this principle apply so far as methods are concerned but also in the matter of fees. No one is authorized to quote another man's fees. As a matter of fact, this is a confidential business arrangement between the patient and the practitioner, and the wide variety of conditions to be met makes it impossible to determine approximate amounts prior to the consultation. Frequently, "Dame Rumor" is responsible for the most ludicrous reports in regard to the amounts of fees charged which, when traced to their finality, have no foundation in fact. Therefore, when a statement is made to a prospective patient, "Go to Dr. So-and-so if you can stand his fee," with usually some factitious amount being named, an intolerable and inexcusable situation is created. *The quoting of other practitioners' fees is not only unethical and unjust but lamentably crude. I cannot conceive of any one with sufficient breeding to enter a profession indulging in such procedure.*

An important subject, pertinent to this discussion, is that professional contact with patients which we designate as the consultation. Unfortunately this period has never been fully appreciated by our profession as a whole, nor has it demanded the respect for it on the part of the public which this type of professional service deserves. In spite of the fact that it is one of the most important contacts with our patients, its present status, in the vast majority of instances, is nothing to be proud of, for it has degenerated into an examination, rather than a consultation. There is a vast difference between these two, which I will differentiate as follows:

An examination may usually be defined as a period during which high pressure salesmanship is used to sell dentistry to patients.

A consultation is a period wherein the professional dentist determines the character and extent of oral deficiencies, diseases, malformations, etc., and makes an effort to determine a means which will safeguard the patient's interest to the highest possible degree. It is a professional service of a high order and is deserving of a professional fee. Thirty minutes is none too long for this important appointment, for frequently roentgenograms must be made and interpreted, careful histories must be secured, and other steps taken which will make it possible for the practitioner properly to visualize the patient's oral problems. It is rather depressing to consider the manner in which this important function of the dentist and the orthodontist is prostituted in far too many offices.

I presume that in this great city (San Francisco) where we are holding our meeting, orthodontists in general require special appointments for consultation, requiring their patients to come during a time of day when they are not rushed with the routine treatment of cases (such as after school hours, or on Saturday mornings). I also presume that here consultation is dignified to the extent that a fee is always charged for it, except where charity is indicated. I regret to say that this same situation does not prevail in Los Angeles. Except in isolated instances, patients are allowed to come any time during the day and, in some instances, without appointment, and in only a few offices is a fee charged for consultation. This, of course, is most lamentable.

If our confreres could only realize that their attitude toward this phase of practice has done and is doing more to cheapen our specialty in the eyes of the public than almost any single factor, they might change their ways. To claim to be a learned profession and then fail to have the strength of one's convictions, is sad indeed.

Like any other specialty which has passed through a rapid evolution, orthodontia has its share of faddists, whose enthusiasms and pet theories have given rise to discussions which have proved confusing both to the laymen and to the members of the dental profession. Outstanding among these are the appliance faddists, whose orthodontic conceptions are encompassed by some special type of mechanism. These individuals virtually "peddle their wares" to their patients, and frequently are guilty, in doing so, of unethical conduct. Just why an orthodontist should explain the mechanical means which assist him in his work to his patients any more than a surgeon should promote the idea of a special type of lancet, the

various artery clamps, scissors, etc., is not clear to me, but in our specialty we have many who indulge in this practice. Some of the claims they make in doing so are so ludicrous as to promote humor, were it not for the fact that patients are not in a position to judge and, therefore, accept many false claims as being gospel truth. Later on, when they meet others in disagreement with such plans, they are naturally confused. This crude practice of "appliance talk" is a good thing for the manufacturer of certain patented forms of mechanism, but just why an orthodontist should wish to become a self-appointed salesman is beyond my powers of perception.

There are several very pertinent points for discussion in Dr. Gray's paper which others will doubtless emphasize. In concluding my remarks, I wish again to emphasize a point I made in the beginning, i. e., that ethics and *good* business practice *are inseparably bound together.*

Dr. Robert Dunn.—If it were possible to enlarge upon what Dr. Gray and Dr. McCoy have said, I should like very much to do so, but they have covered the ground so thoroughly that anything I might say would be merely repetition.

I think the matter of fees is largely the same here as it is in Los Angeles. We likewise have difficulty in collecting consultation fees at times. However, I have made a rule, since being in practice, to charge a consultation fee as does Dr. McCoy, and I do not feel that I have lost anything by it.

Dr. E. F. Lussier.—I think that we have on very few occasions an opportunity of talking on some of the points that were brought out in Dr. Gray's paper, and I should like to stress just one particular point.

Leaving aside the probable question of charging for consultations, I think that it is quite necessary to make one—I mean a thorough one. I think that if we could have somewhat of a universal system or method of procuring diagnostic data, it would help materially in eliminating shoppers. It would begin immediately to educate the public, and we read on many occasions today that we must educate the public in regard to dentistry. It would give us an opportunity to educate the dentist, and if, as I say, it might be a universal system, it would enable us by compiling this accumulated material to contribute to our own education.

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THE LOCAL FACTORS IN MALOCCLUSION*

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PATHOLOGY being defined as "the science of diseased or abnormal processes and conditions of the body,"[1] we are entitled to class the malocclusions of the teeth among the pathologic manifestations and, accordingly, to divide them into disturbances of endogenous and exogenous origin. Endogenous is defined as "arising internally, in the body itself, from internal causes," exogenous as "derived from the outside, from external causes."[1]

But cases of malocclusion have been described in which it has been stated that a combination of two active momenta is necessary for the origin and development of the anomaly in question. If in accordance with the theory of Stallard[2] we assume that certain "pillowing habits" are responsible for a narrowing of the maxillary arch but are not capable of obtaining this effect unless a certain degree of abnormal softness of the bone is present, we must evidently consider that this softness is the primary cause. A malocclusion of this kind ought apparently only to be classed as local provided that the softness is the primary result of some external cause as, for instance, insufficient sunlight, faulty diet, or some other similar factor. But if the softness is a result arising "from internal causes," the malocclusion must be classed among endogenic disturbances. Our ignorance concerning the etiology of malocclusions unhappily prevents us from being able to work out a scientific classification of them. This paper will consequently in an eminent degree be influenced by this uncertainty regarding the etiology, and will in all probability among local malocclusions include some which a more close study will disclose as being of a more general origin. On the other hand, it will omit types which in reality ought to be included.

In a treatise on the normal and pathologic physiology of bone, W. Müller[3] has introduced the chapter on general biology of the bone with the following passage: "In man as in animals the separate bones have a form, which is exactly similar in each individual in the same species of animal almost in the most minute details, also as regards the finer texture. Notwithstanding this fact, the form of the bone is in no wise absolutely rigid and unchangeable. Under the influence of all kinds of external influences changes of form and details may occur in the individual subject. The form and texture of a bone is consequently also the result of certain components affecting the bone itself. The extent of the results of these components must be analyzed separately in their several details.

"A very important question regarding form and texture of bone is therefore: how much of the form and finer texture of the bone has received its foundation in the embryonal stage of the development of the individual and is

*A paper presented at the Second International Orthodontic Congress, London, 1931.

accordingly unchangeably fixed, and how much has been acquired later through the medium of external, on the bone itself, operating factors?''

The teeth being attached to the jaws, and as these latter often exhibit deviations from the typical form, which in a number of instances are manifest as malocclusions, it becomes a problem of great importance to decide which of these malocclusions have received their foundation during the embryonal stage and are ''unchangeably fixed,'' and which have been acquired later through external influences operating on the jaws, that is, which are endogenous and which are exogenous.

If we approach the problem from a purely theoretic point of view, we find that we have here a rational differentiating principle for the classification of malocclusions. A classification founded on this principle would also be of eminent practical value, as the possibility and desirability of correcting or preventing both types would probably in some degree be dependent on which class the case belonged to. But as a result of our incomplete knowledge of the etiology a classification like this is not easy to effect.

It is also in all probability impossible by artificial means to produce changes which cannot be distinguished from externally similar idiovariations. It would, therefore, appear to be hopeless to expect by means of mechanical and other methods to be able to effect such changes in a malocclusion of a hereditary character as to bring about an occlusion identically similar to and indistinguishable from a naturally developed ''normal occlusion.'' Our first great group, malocclusions caused by conditions that received their foundations during the embryonal stage, occupies a special position in relation to the others (caused by mechanical, nutritional and internal secretory influences) in this respect, that they cannot be prevented from appearing, and that a mechanical treatment of them does not effect a perfect result.*

The various degrees of difficulty the practitioner encounters during his work will naturally evoke in his mind a different valuation of different anomalies, manifesting itself in, one might say, a greater respect for some types. If we class the malocclusions according to the resistance they offer to treatment, we must naturally place hereditary malocclusions first. The second group will be placed lower. But it is easy to understand that the three subdivisions under the group are not equivalent, especially if it is our intention to have a class of malocclusions of a very restricted ''local'' character. We should expect that the effects of nutritional and internal secretory disturbances will have a more profound influence than the purely mechanical factors.

Before discussing these mechanical moments, which according to the evidence supplied by a number of authors exert influence on the growth of bone, and which therefore also ought to be taken into consideration as possible causes of malocclusion, we must take note of one fact. There is a very popular idea among orthodontic writers that the ''local'' malocclusions ought to com-

*It is not my intention to assert that hereditary malocclusions cannot be treated with a result that is satisfactory from a functional and hygienic standpoint. I wish merely to emphasize that it is not possible to attain a result so perfect that it is indistinguishable from a naturally developed case of "normal" occlusion. On the other hand, if a malocclusion of a "local" character be treated at a sufficiently early stage, the result will be practically impossible to distinguish from a natural normal occlusion.

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prise several forms which from a purely clinical view would appear to be "general." The most obvious conclusion as to the difference between general and local malocclusion appears to be that terms such as general, primary, constitutional, etc., apply to those which are symptoms of some disturbances affecting the growth of the jaws. Local, secondary, etc., comprise anomalies in the positions of the teeth caused by the influence of factors operating directly on one or more of the individual teeth. Certain authors are of the opinion that agencies of the latter purely local variety may exert so powerful an influence on the growth of the jaws that the resulting malocclusions would in the older classifications have been registered as "general." Fig. 1 shows a malocclusion locally restricted to the left side, of a type often occurring after the premature

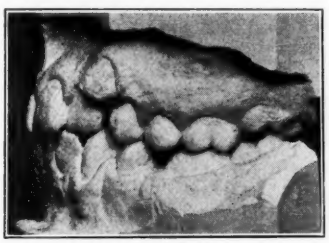


Fig. 1.—Local displacement of canine following premature loss of deciduous molars.

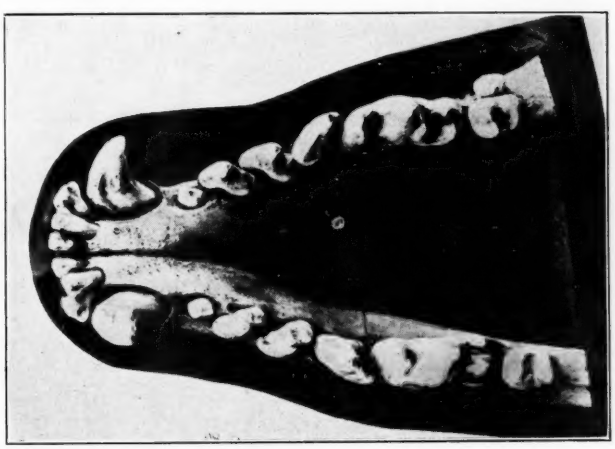


Fig. 2.—Symmetrical malocclusion in the mandible of a wolf reared in captivity (from a paper by A. Wolfgramm).

loss of deciduous molars. The general development of the denture appears to be normal, the cause purely local, the result a typical local malocclusion. Fig 2 shows a denture of a wolf raised in captivity. The malocclusion is symmetrical. A superficial examination would probably class this deformity as "general," whether we suppose that it received its foundation during embryonal life (Müller's group 1) or whether it is a result of nutritional disturbances or disorders of the endocrine system. The scientist who published this case, Wolfgramm,[4] states that the cause was subnormal functioning of the jaws, a result of the animal's being reared in captivity. In the practice of orthodontics, Ferris[5] has made use of a similar explanation of the origin of bimaxillary crowding, and

has devised a method of exercising the masticating apparatus, which he states may cure or at least modify these anomalies in man.

Figs. 3 and 4 show extensive malocclusions of types that may well be called general. But Stallard[2] has published similar types and believes that they are results of extraoral pressure, that is, a local factor.

Before discussing the arguments for and against the possibility of the local character of these superficially "general" malocclusions, we shall briefly

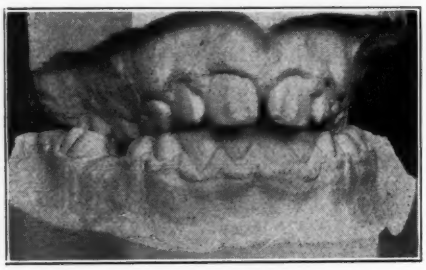


Fig. 3.

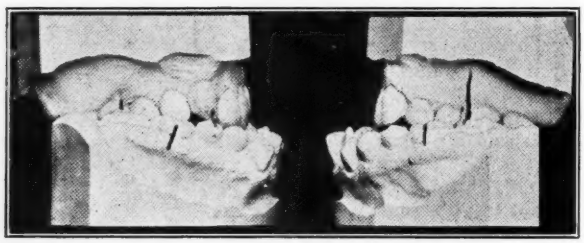
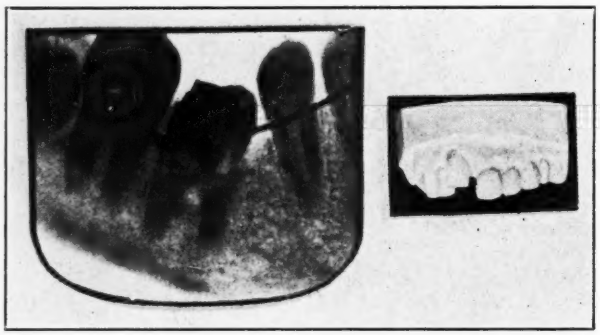


Fig. 4.

Figs. 3 and 4.—Types of extensive malocclusion of a general character which, according to Stallard, may be due to extraoral pressure.



A *B*

Fig. 5 *A* and *B*.—Pathologic disturbance of the alveolus leading to local malocclusion.

recapitulate some facts concerning the influence of mechanical agents on bone growth as stated by authorities on bone pathology.[3] These influences are of two kinds: (1) direct injuries on the growth zones; (2) the influence of permanent mechanical strains especially through pressure.

We shall also examine whether or not we are able to find momenta of malocclusion as results of to some extent analogous processes.

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DIRECT INJURIES ON THE GROWTH ZONES

Among these Müller mentions inflammatory disturbances in cases of tuberculosis and osteomyelitis, etc., which with great regularity cause shortening of the bones.

It is evident from the experimental work of Brash[6] that among other regions the alveoli of the teeth are sites of growth and that they participate in the height growth of the face. We occasionally find cases in which some portion of this zone has been subjected to a pathologic disturbance. The normal height growth of the region in question does not occur and malocclusion results (Fig. 5 *A* and *B*). This tendency is active as long as the height growth continues, that is according to Hellman,[4] until after the twentieth year. This condition is most easily observed in the region around teeth especially exposed to injuries involving the pulp during the period of most active growth, that is, permanent incisors which have received external injuries and first permanent molars in which destruction of the pulp has followed from early caries.

THE INFLUENCE OF PERMANENT MECHANICAL STRAINS ESPECIALLY THROUGH PRESSURE

There is a very popular idea that a certain degree of intensity of the functions of mastication and biting is essential for the development and growth of the jaws to a size admitting the anatomically perfect "normal" occlusion to be attained in a natural way (that is without help of orthodontic methods) or to be retained after such treatment. Angle, Hawley, Rogers, Kelsey, Andresen, Weinberger and Ferris may be mentioned among practical orthodontists who have written to that effect. Wolfgramm[4] is a scientist in biology who arrived at a similar conclusion many years ago.

These authors appear to have no doubts in this question. But if we study the work of scientists of the medical profession who have made a special study of the effects of muscular function on bone we shall not find the same unanimity. Several observations seem to indicate that the "congenital component" has an extraordinary influence on the definite size of a bone, and that a remarkable absence of function does not prevent the bone from attaining its normal size.

In his summary of the discussion of this problem Müller[3] makes the following remarks: "The embryonal form has most certainly a very important effect in determining the final form of the bone. At present it is not possible to state definitely to what extent this occurs. At any rate its influence must not be underestimated. In spite of the total absence of nearly all functional momenta we find nearly normal bone forms, and the old form is preserved . . . . . completely in spite of a change of function. But nearly all the minor modifications of the surface are probably acquired by means of function."

On the other hand, a change of function causes a radical rebuilding of the finer texture. Müller has described a case in which tibia and femur had healed into one piece. A considerable change had occurred in the density of the bone, but the form of the bone remained practically unchanged as late as three years after the healing. Although the finer structural elements have in

a most remarkable degree adapted themselves to the requirements of the change of function, we do not find any unlimited apposition or resorption. The external form has been conserved in spite of a radical change of the static conditions. There are certain limits to the transformation of bone which, naturally, we do not know in all their details. On the other hand, we know that after fractures extensive deformities are in a surprising degree obliterated by means of bone transformation.

In certain instances, however, a change may be effected in the form of the bone. Müller has observed three different degrees of strain. If a section of the radius is removed and substituted by a transplanted joint, the ulna will be so strongly influenced by the additional strain that it will increase to three or four times its original thickness. If, on the other hand, a similar operation is performed on the ulna, which is a weaker bone, the additional strain is not strong enough to effect a similar reaction. Finally, if the mechanical strain is so great that it exceeds the bone's capacity of resistance, the third stage is reached, and instead of the bone becoming thicker a pseudarthrosis develops.

The three different degrees are illustrated as follows:

1. A transplanted joint on the ulna does not effect a thickening of the radius.
2. A transplanted joint on the radius effects a thickening of the ulna.
3. An excessive strain does not effect a thickening but a pseudarthrosis.

Is it possible to apply this to cases of malocclusion in regard to: (1) the connection between subnormal function and some form of malocclusion; (2) an increased strain's capacity of effecting a spontaneous development of normal occlusion; or (3) the maintenance of a normal occlusion which has been attained by means of orthodontic methods?

In the experiments of Müller the diameter of the ulna appears to be about half that of the radius, so an additional strain of 25 per cent was insufficient to change the thickness of the radius. This latter bone had accordingly a margin of safety of at least 25 per cent. This appears to indicate that it would be rather rash to expect that a subnormal masticating function will result in a crowding of the teeth or a subdevelopment of the maxillary or mandibular bases. As we have seen "in spite of an absence of nearly all functional momenta nearly normal bone forms develop," and as an extra strain of 25 per cent in Müller's experiments was not sufficient to change the diameter of the bone, we have certainly very valid reasons to doubt the casual connection between the crowding of teeth and subnormal function.

We have previously mentioned that a rational classification of bone forms and consequently also of malocclusions ought to comprise two grand divisions: (1) *those which have received their foundation during the embryonal stage;* (2) *those caused by other factors.*

If it could be proved that, for instance, bimaxillary crowding was not founded in the embryonal stage but was an effect of subnormal function, then this malocclusion would have to be considered as "local," "acquired," etc., that is to say it belongs to the group of variations which in the literature of the science of heredity are called "modifications" or "paravariations." The mate-

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rial which has been advanced to substantiate this seems to me very deficient as evidence, but as it is my intention to publish elsewhere my reasons for giving it this interpretation, it is not necessary to repeat them here.

To these "other factors" we must also count as causes of malocclusion various sleeping and posture habits made much of by Stallard.[2] From my correspondence with Dr. Stallard I gather that at least some years ago he was of the opinion that extraoral pressure might cause even so extensive deformities as V-shaped palate and opistognathism. Kjellgren[8] made attempts to test this theory by experiments, and states that he really did succeed in compressing the dental arch somewhat. However, it seems probable that even if an individual keeps up an abnormal "pillowing habit" during the whole night, the teeth will relapse into their original position during the following day.*

In cases of deformed arches (opistognathism, narrow palatal vault, bimaxillary crowding) it seems difficult to follow the arguments of Stallard. But it appears to me that conditions are very different in cases like that shown in Fig. 6. The malocclusion appears to be the result of a displacement of the

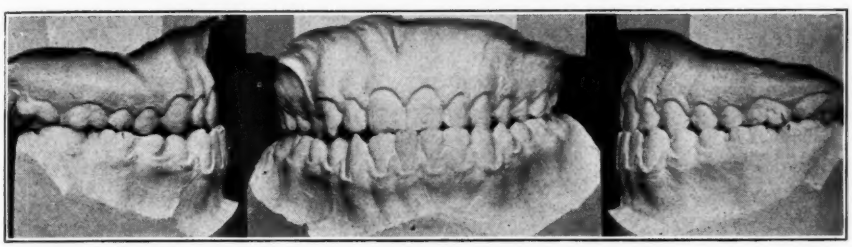

Fig. 6.—Malocclusion as a result of a displacement of the mandible to one side.

mandible toward one side. If this has been brought about by any of the means Stallard suggests (external pressure during sleep or a habit of resting the mandible against one of the hands), then it appears reasonable to assume that this habit is maintained during the intervening time, and that a permanent malocclusion will result. Closely related to these are the cases of antero- and posteroclusion which, according to A. Martin Schwarz,[9] have their origin in a bending of the head backward or forward, and which this author believes may be broken by very simple means. Another class of malocclusions belonging here are those which are caused in otherwise normal dentures by thumb-sucking, lip pressure, etc.

As has been published elsewhere, it is often exceedingly difficult to decide whether a malocclusion in a given case is local or not. This is quite to be expected, as we have not yet definitely proved which of these anomalies are inherited, "developmental," "constitutional," or results of disorders of the internal secretion or faulty diet. This is especially the case in symmetrical malocclusions.

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*In a note published in *The British Dental Journal*, **52**: No. 8, 1931, reference is made to an article by M. A. Boynton and F. L. Goodenough in *The American Journal of Psychology*, April, 1931, in which article is stated that from observations of children during sleep it appears that "there was about one change in twenty-five minutes during an average nap period of seventy-nine minutes," and the reviewer draws the conclusion that "it seems difficult to imagine that a pillow habit such as sleeping with the fist under the cheek is likely to be maintained long, without change, to induce a deformity of the dental arches."

Distoclusion or posteroclusion is very common, and quite a large proportion of the case reports of practitioners are devoted to treatment of this deformity. It is apparently often considered to be of a more general character. In my own opinion it is at least very often of a local character, and I give the following facts as reasons for this statement:

1. Posteroclusion is generally easy to correct and retain with mechanical appliances.
2. It is often found in cases of normal apical bases.
3. It is often unilateral.
4. It has been found in one of a pair of identical twins.[10]

But other authors have a different view. Grünberg[12] is of the opinion that the mandible is underdeveloped and Rubbrecht[13] believes it may be hereditary.

Anteroclusions are often and, I believe, for the most part of a very different general character, and their development presents great differences. But it seems that they also may be of a local character. It seems possible that posteroclusions of a hereditary character may also be found, although it has not yet been proved.

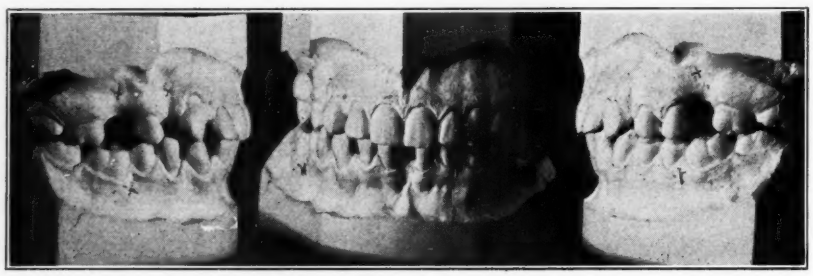

Fig. 7.—A case of a normal apical base. The loss of certain teeth at various periods has caused spacings between the anterior teeth.

There is as yet no unanimous opinion concerning the local character of the types of malocclusion we have thus far been discussing.

THE EFFECTS OF EARLY LOSS OF TEETH

We shall now proceed to a group of malocclusions in which the local causes are more generally accepted, although the detailed particulars are by no means definitely understood. The most important of these are disturbances of the positions of the teeth brought about by early loss of deciduous or permanent teeth. Space does not allow anything like a complete account of these malocclusions. Nor is this necessary as the facts that are known are fairly accurately described in the textbooks. I shall confine my observations to a few facts which I have noted.

As the deciduous incisors are smaller and the deciduous second premolars are larger than their successors, the results of premature loss of teeth of these groups will differ from each other. In a case of normal occlusion one of the maxillary central incisors was struck out, root and all, at two years of age. No treatment was suggested. The loss had no effect whatever and the permanent teeth erupted in normal occlusion. In another case of ideal normal occlu-

sion the loss of the first deciduous premolar at the age of nine years did not have any deleterious effect. We sometimes find the statement that the early loss of the maxillary deciduous canine may cause a horizontal anterior movement of the deciduous premolars. When we consider the very common occurrence of spaces behind the deciduous canines in growing jaws, this statement appears dubious. Concerning the effect of early loss of the second deciduous premolars no diversity of opinion seems to occur.

The loss of individual permanent teeth after the growth of the skeleton is completed does not necessarily cause changes in the position of the remaining teeth if the occlusion is in other respects favorable. But if the loss in question has taken place before this, extensive displacements may occur. The case in Fig. 7 is a good example, as it is apparently a case of normal apical base. The age of the patient was twenty-eight years. The first left mandibular molar was lost at nine or ten years. The first right mandibular molar was lost at nine or ten years. The first right maxillary molar was lost at fourteen or fifteen years. The first left maxillary molar was lost at fourteen or fifteen years. The first right maxillary premolar was lost at seventeen or eighteen years. An extreme spacing has been the result.

SECONDARY RETRUSION OF MAXILLARY INCISORS

The well-known retrusion of maxillary incisors in the type of posteroclusion commonly known as Angle's Class II, Division 2, may probably in some cases be considered as a local complication following the posteroclusion. Similar conditions may sometimes be observed if the mandibular arch has been arrested in growth by early loss of teeth. I have occasionally noted and have described elsewhere a compression of the anterior portion of the mandibular arch in otherwise successfully treated cases of Angle's Class II, Division 2.

ABSENCE OF ABRASION OF DECIDUOUS TEETH

Finally, we have a local factor which, although intimately connected with a subnormality of function, cannot be said to cause an underdevelopment of the denture. It is the absence of attrition in the deciduous denture. As Friel[14] has demonstrated, the height of the unabraded cusps of the deciduous denture prevents the mandible from attaining its final correct anterior position.

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DISCUSSION

Dr. Spahn, New York City, asked whether Dr. Lundström had said that bone did not increase in size from mechanical stimulation.

Dr. Lundström, in reply, said that he had not experienced this personally, but had only read about it in the writings of German pathologists. It was said that the inherited form of bone had a great influence on its final form. The texture and surface are influenced and muscular traction led to a thickening of the bone. He, himself, was not prepared to say whether the bone grew from mechanical stimulation. It often appeared that the mandible had grown larger, and it was easy to say but difficult to prove that this had occurred as a result of treatment.

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OVERSIZED TONGUES AS CAUSES OF MALOCCLUSION*

By Friedrich Neumann, Med. Univ. Dr., Moravska Ostrava, Czechoslovakia
Assistant, State Dental Institute, Prague

THE orthodontists are becoming more and more convinced of the importance of different etiologic factors in the treatment of malocclusions. Numerous observations and therapeutic experiments have been made on the function of the facial muscles, but no attention has been paid to the influence the size of the tongue may have on the development of malocclusions. Observations on cases after the resection of the tongue, as well as on cases where patients are suffering from very soft and slowly growing tumors, have shown that the jaws are very easily deformed in a most extraordinary way by the small but continuous forces of the facial muscles or of the tissues of the tumor. Surgical papers also report deformities of jaws by so-called macroglossias. These macroglossias are lymphangiomatic or hemangiomatic tongues of extraordinary sizes, endangering the life or the mental and bodily development of the patients. Sometimes muscular macroglossias have also been observed, formed by hypertrophy and hyperplasia of the muscular tissues.

I am unable to find recent papers on the question of whether a normal or nearly normal tongue may be relatively too big for the dental arch and may cause an abnormal position of the teeth. During the last few years I have observed numerous cases, some of which have been published by Dr. Karel Wachsmann of Prague and by myself, in which apparently the tongue is causing malocclusions. I want to show some cases of this kind which I have observed recently.

Case 1.—Mr. T. H., twenty-seven years old, bodily and mentally well developed, does not show any other abnormalities. His denture is regularly arranged and nearly normal, but there is spacing in the region of the anterior teeth (Fig. 1). Such spaces are only to be found in the mandibles of patients with mandibular prognathism, with acromegaly, and in the jaws of patients suffering from periodontic disturbances. The x-ray pictures show the absence of any disturbance of this kind, and a periodontic disturbance can also be excluded by the way the jaws are articulating, for the anterior teeth do not meet at all if the mandible is moved forward. There is no reason for the spaces other than the size of the tongue, which has created the necessary space for itself by moving forward the anterior teeth of both jaws and by enlarging the jaws, thus creating the spaces between the front teeth and tipping forward the crowns of the mandibular teeth as well as those of the maxillary teeth.

Case 2.—A case similar to Case 1 is that of Mrs. H. S. (Fig. 2). The patient is twenty-nine years old. There is almost an open-bite, with all the other abnormalities shown in Case 1. Mrs. S. told us that her father and her sister also have the same malocclusions, but a little less pronounced.

* Paper presented before the Second International Orthodontic Congress, London, July, 1931.

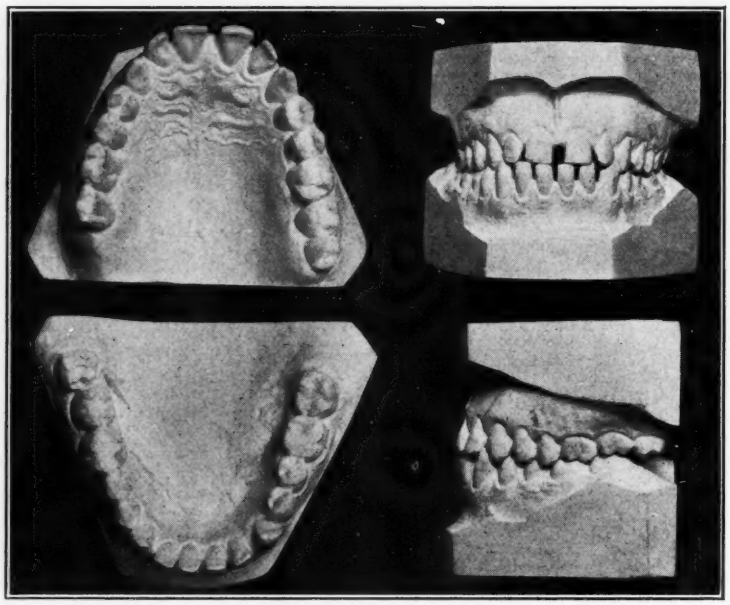

Fig. 1.—Case 1. The widths of the four maxillary incisors are 7 mm., 8.5 mm., 8.5 mm., 7 mm. = 31 mm. The widths of the jaws calculated by the Pont index should be: from $\underline{4|}$ to $\underline{|4}$ 39 mm., actually it is 42 mm.; from $\underline{6|}$ to $\underline{|6}$ 48.5 mm., actually it is 53 mm.; from $\underline{\overline{5, 4}|}$ to $|\overline{4, 5}$ 39 mm., actually it is 42.5 mm.; from $\overline{6|}$ to $|\overline{6}$ 48.5 mm., actually it is 54 mm.

Fig. 2.—Case 2. The widths of the jaws are normal, but the incisors are protruded and the crowns tipped forward.

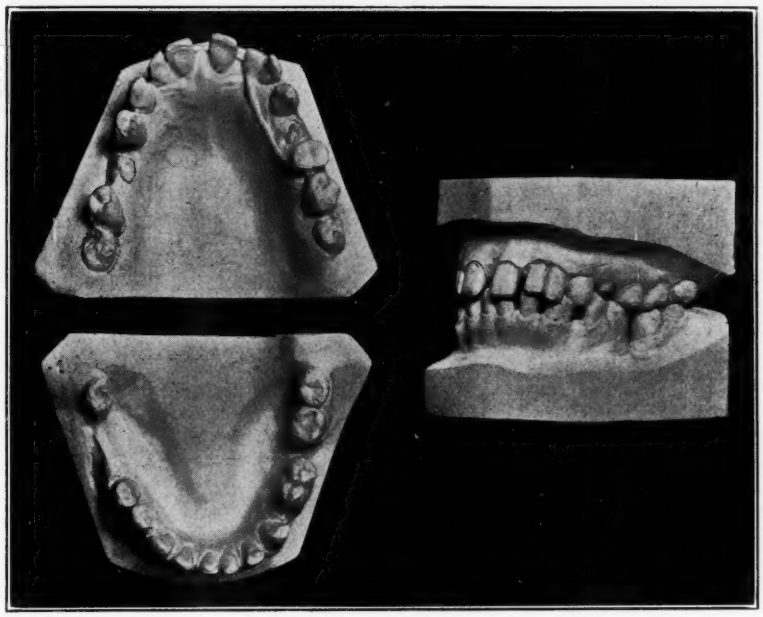

Fig. 3.—Case 3.

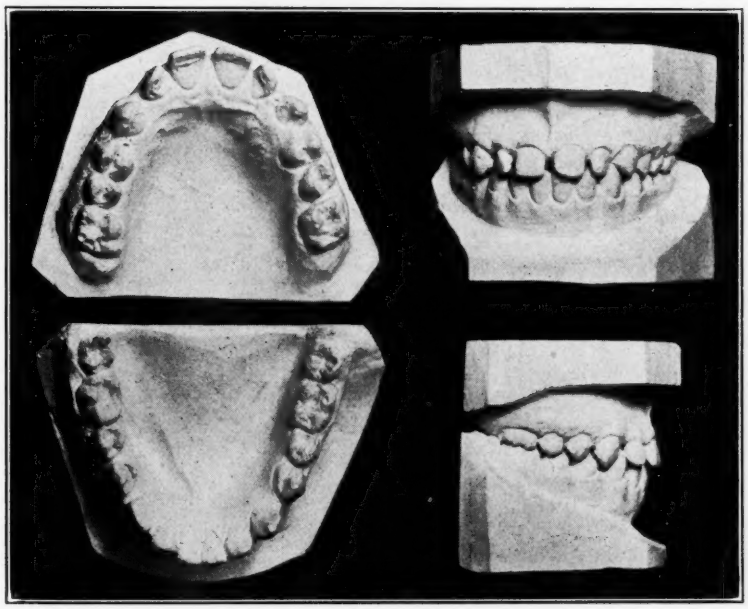

Fig. 4.—Case 4. The widths of the four mixillary incisors are 6.5 mm., 8.5 mm., 8.5 mm., 6.5 mm. = 30 mm. The widths of the jaws calculated by the Pont index should be: from $\underline{4|}$ to $|\underline{4}$ 37.5 mm., actually it is 42 mm.; from $\underline{6|}$ to $|\underline{6}$ 47 mm., actually it is 51 mm.; from $\underline{\overline{5, 4}|}$ to $|\underline{\overline{4, 5}}$ 37.5 mm., actually it is 43 mm.; from $\underline{\overline{6}|}$ to $|\underline{\overline{6}}$ 47 mm., actually it is 51 mm.

Fig. 5.—X-ray pictures of the jaws of an eleven-year-old boy showing extraordinary spacing between the permanent teeth.

This hereditary factor is proved even better by the last two cases of this kind which I want to show: Mrs. Sch., thirty-four years old, and her son, twelve years old.

CASE 3.—Mrs. Sch. (Fig. 3) showed such large spaces between her front teeth that about twenty years ago she desired a cosmetic improvement. This was made by such orthodontic work as was usual at that time. One incisor was brought forward by a strong wire from a shell crown on the second right maxillary premolar, so that now there are five incisors. But this artificial incisor also proves that she had almost the same spaces at a very early age and that these spaces have not been created at a later period.

CASE 4.—The son (Fig. 4) shows similar spaces. His sister, nine years old, seems to be in a similar predicament, but there is no possibility of giving certain evidence before all the permanent teeth are erupted.

Now there arises the question of whether we can make oversized tongues responsible for these anomalies. In a well-developed denture there are no spaces between the teeth. The muscles of the lips and cheeks and the air pressure are pressing the teeth together, but the mutual support of the teeth forming the dental arch, as well as that of the tongue, is preventing the constriction of the arches by these forces. Thus the size of the normal dental arch is determined by the size of the teeth, especially by their mesiodistal diameters. If the teeth are very small, even a normal tongue will not find space enough in the small dental arch and will press the teeth forward and aside.

When measuring the teeth of our patients, we sometimes do find very small incisors. The size of the tongue cannot be measured easily on account of the variations of the form of its muscular tissues, and there are no measurements known for determining the normal or abnormal size of the tongue of a living man. We know that tongues of younger people, showing fissures, are often very big. The tongues of some of our patients did show such fissures, but some of them did not.

There is no explanation for the position of the teeth of these cases other than the pressure of the oversized tongues. It is difficult to say whether the same influences are working on the denture of an eleven-year-old boy, who has extraordinarily large spaces between the canines and the first permanent molars of the mandible. The x-ray pictures (Fig. 5) show the premolars, which are not yet erupted, in a tipped position in the mandible. There are very small spaces between all the maxillary teeth, so that these teeth occupy almost the same space as the mandibular teeth. Only one mandibular molar is somewhat in distoclusion, biting tip to tip with the maxillary one, while the other pair of molars is in neutroclusion.

In previous papers Dr. Wachsmann and I have discussed the possibilities of the development of open-bite and of mandibular prognathism by the influence of oversized tongues, but it is rather difficult to prove this. Further observations may give more evidence on these points.

Together with the cases shown today, we have published twelve cases found among the patients of our clinic and offices, which certainly, or probably by the influence of the tongues, have developed malocclusions. Doubtless many ortho-

dontists are able to show similar cases, which would be very desirable for the further study of this kind of malocclusion.

DISCUSSION

Mr. A. T. Pitts (England).—He thought that Dr. Neumann had made an extremely interesting contribution and one that deserved to be followed up.

One of the conditions in which the tongue is unusually large is that of the Mongolian idiot. It is a very large tongue with deep fissures. He had had the opportunity of seeing a considerable number of these children. If Dr. Neumann's contention was correct, then undoubtedly one should find very well-formed arches with spacing of the teeth in these cases. Usually malocclusion has not been a feature of Mongolian idiocy, but he (the speaker) had collected two or three cases in young children with definitely contracted deciduous arches, so that in this particular condition in which we know the tongue to be unusually large, the possibility of contracted arches does exist.

It seemed to him possible that it might not be so much the size of the tongue as its muscular power, for one could have a large tongue, but it could be flabby and without much power and could not affect the arch. Dr. Friel has made some observations on the power of the tongue, and it would be interesting if he could link up his cases with those of Dr. Neumann.

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THE CONSIDERATION OF MALOCCLUSION OF THE TEETH OF CHILDREN AND ADULTS*

Involving the Absence of Permanent Teeth, Whether Congenitally Missing or the Loss May Be Occasioned by Accidents, Extraction or Other Contributing Causes

Hugh Grun Tanzey, D.D.S., Kansas City, Mo.

IN DEALING with this title I am not unmindful of the fact that others probably more proficient have preceded me in similar channels of investigation, and have gone more extensively and more thoroughly into the analysis of their research than I have undertaken to do. It is more than likely these men have been censured plenty also, for attempting to effect, according to their best judgment, the most satisfactory conditions for these unfortunate patients presenting oftentimes rare complications, which require heroic decision and which test one's faith, regardless of the chosen course.

After experiencing several faltering expeditions into these doubtful regions, I have come to the conclusion that we might sometimes adopt a more generous attitude toward our contemporaries even when we disagree with their judgment and when their attainments outwardly appear disappointing.

Prejudice is a child of ignorance, conceived and reared in an atmosphere intolerant with respect to progress and adventure. Often our most sincere resolutions are condemned because of a total lack of sympathy and of discriminating attributes.

Early in my orthodontic career, when our methods of attack would be considered now, more primitive, I came into active conflict with several complicated adult cases of malocclusion with questionable characteristics and doubtful outlook. With an abundance of ego and a dearth of illuminating experience, I went in for big training, i.e., I did exactly what I do now in nearly every instance, start all three cases (difficult cases invariably arrive in groups of three, believe it or not) trusting in the "law of averages" to clear me if my conscience fails, and leaning over backward, toward the Lord for strength to work my way out. I have never ceased to marvel at the velocity with which teeth sometimes move in the direction one desires, when the apparatus is all working nicely, and how in spite of "hell and high waters" at other times teeth will go the wrong way.

After these years of consistent endeavor to make the best of mutilated and complicated cases, I am convinced that we are sometimes justified in sacrificing teeth in order to compensate for loss of or the failure in nature to provide teeth in other related parts.

In former writing along similar channels,[1] I have recited cases where the x-ray examination had disclosed facts which completely changed my plan of

*A paper presented at the Second International Orthodontic Congress, London, 1931.

attack.[1, 2, 3, 4, 5, 6] Cases have also been reported which if we were afforded the chance to do again, would, I feel, be undertaken with a greater degree of confidence.

The younger and less experienced members of any branch of the profession are not alone guilty of the practice of making snap judgments concerning the most efficient and acceptable way to treat a given case of malocclusion. In fact we are all at times seized with a desire to demonstrate our superior wisdom and to speak right out in pronouncement of a diagnosis, the proper treatment,

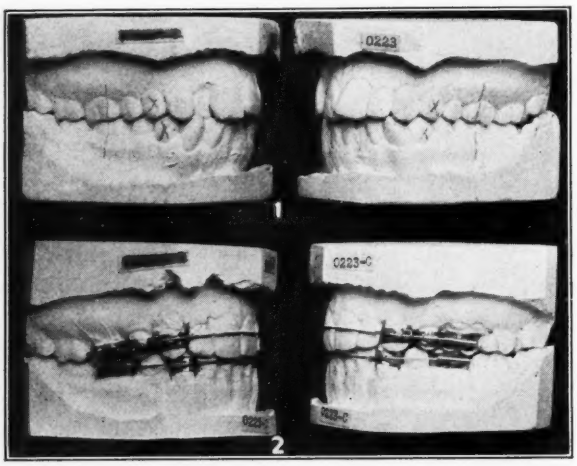

Fig. 1.—Patient a girl, twenty years old. Class I (neutroclusion). Mandibular and maxillary first premolars were extracted. Appliances were placed July, 1929.
Fig. 2.—March, 1931, eighteen months after treatment was started. Shows appliances used in closing spaces.

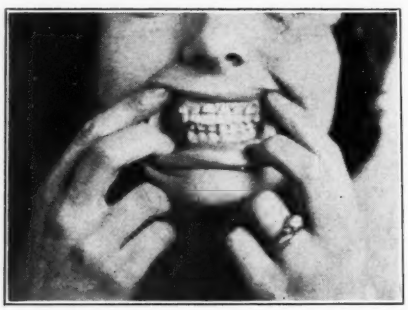

Fig. 3.—Photograph of patient whose models are shown in Figs. 1 and 2, eighteen months after treatment was started. At this time Hawley retaining appliances were placed.

prognosis, a commensurate fee and much valuable information aside from the real problem.

I have come to believe that any opinion given as to the proper procedure, without a careful analysis in conjunction with radiograms, plaster casts, and other available records, would not be reliable. It usually falls to my lot—being the senior member of our association to sit down within easy reach of all the records and side lights obtainable; with callipers, pencil and pad; casts of similar types of cases before and after treatment, with verification of successes or failure from our records; and draft a sketch of an appliance which I think indicated. This sketch accompanied by an estimate of the time required for

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treatment, an itemized statement of the preliminary fee, the annual service fee and the terms of payment, together with provision for adjustment of the fees and other features of agreement are submitted to the client for approval. In arriving at this conclusion, especially when considering the more complicated cases, it is not at all unusual for me to call in my associates for their opinions.

This particular group of malocclusions comprises so many different phases, accompanied by such varying degrees of deformity, that it will be possible only to mention some of the more common types that are likely to appear for your consideration.

There is a quite noticeable number of cases with congenitally absent teeth, probably 5 per cent of all malocclusions. The amateur and sometimes the adept diagnostician is likely to overlook this feature which we believe often involves the most exasperating efforts to overcome.

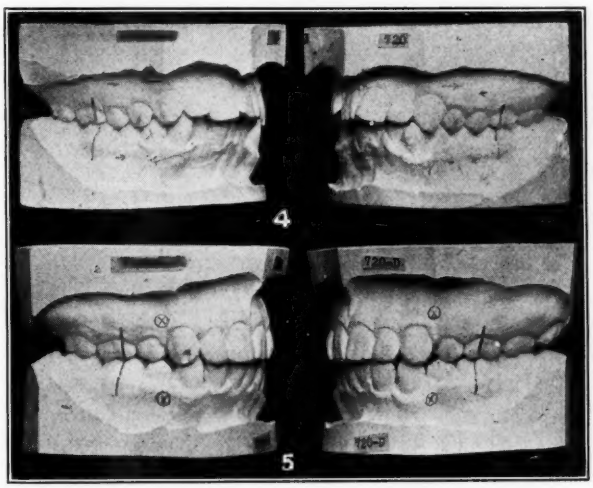

Fig. 4.—Patient seventeen years old, Class I (neutroclusion). January, 1929. Maxillary and mandibular right and left first premolars were extracted. Treatment appliances were placed. This case presents a relapsed condition subsequent to orthodontic treatment.
Fig. 5.—After two years' treatment, Hawley retaining appliances were placed.

The mutilated cases in which a first permanent molar has been lost will sometimes test one's nerve and ingenuity. May I digress here to ask, is there any possibility that nature has, in her wisdom, decreed that since ignorance has been dispelled and civilization has become common she can dispense with the first permanent molar? This tooth is a sort of connecting link between the deciduous and the permanent sets of teeth; it erupts at an inopportune period in the process of development, unexpected, unwelcome and often accompanied by a severe pathologic disturbance. There are four of them, large, due to arrive about the same time that four incisors should show up; frequently they are decalcified and imperfectly formed before emerging from the gingivae. Again in your opinion what percentage of the highly enlightened race is at all conversant with the significance of this tooth? What percentage of those children reared in homes surrounded with culture and affluence will lose one or more of these first molars, and later show up with impacted third molars, rotated second molars and of course other manifestations of crowded teeth and under-

developed jaws? (We say because of improper diet and disuse of mastication.) Is the first permanent molar of better construction and more likely to survive than the third molar?

What percentage of cases successfully treated and discharged at about the twelfth or fifteenth year will return in a few years to disillusion the once very confident operator? If any tooth or series of teeth is going to be a disturbing element in the process of dentition and facial development, should we not provide for the elimination of the offending member before the exigency? In times past we have on several occasions started orthodontic treatment in cases—where a first permanent molar had been lost—with the preconceived idea of closing that space and of correcting the malocclusion without sacrificing other teeth. In the majority of these instances, we now believe, we could have effected an earlier and better compromise by resorting to the extraction of one and some-

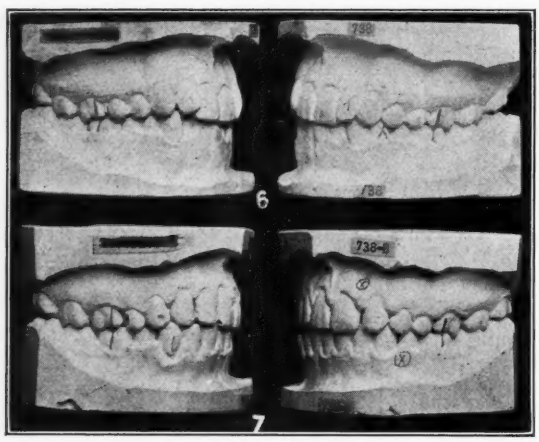

Fig. 6.—Patient a girl. Class I (neutroclusion). October, 1929. Appliances were placed after maxillary left lateral dummy was removed. Mandibular first premolar was extracted.

Fig. 7.—In June, 1931, patient twenty-five years old, treatment appliances were removed and retaining appliances were placed.

times three other teeth, preferably the first molars, but prevailing conditions should govern this decision.

We have found it rather difficult to adjust the teeth in a satisfactory manner where there is an unbalanced number. We have found that teeth move forward more readily than backward, and in fact one must use precaution in order to select the proper anchorage to move teeth back before the spaces are closed by the forward movement of the teeth adjacent and distal to the teeth which have been eliminated.

While it is not the purpose of this paper to describe the technic employed in the treatment of compromise cases, it should be said that an appliance should be elastic enough to permit the swinging movement backward of those teeth in front of the space, and yet sufficiently rigid to provide for bodily movement of the teeth that are to be moved forward through the alveolar process. It is of course assumed that in the majority of these cases there has been a forward displacement or tipping of those teeth in front of, and likely including, the first permanent molars in both jaws. Since the maxillary molars move forward

more readily than the anterior teeth move backward, and the mandibular molars are more reluctant to move the distance we desire, it frequently becomes necessary to resort to intermaxillary anchorage. I think it apropos to state that we close the spaces caused by the extraction of molars in from twelve to eighteen months. The usual tipping and rotation that are so common in collapsed arches where teeth have been extracted and the case abandoned, are avoidable; we do not have sufficient disturbance of the investment tissues to invite pyorrhea. The amount of root resorption following this treatment as compared to other compromise methods is negligible, and the appreciative response from satisfied patients is very gratifying.

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PRINCIPLES INVOLVED IN THE LINGUAL AND LABIAL ARCH WITH AUXILIARY SPRING ATTACHMENTS*

OREN A. OLIVER, D.D.S., F.A.C.D., F.I.C.D., NASHVILLE, AND
CLAUDE R. WOOD, D.D.S., KNOXVILLE, TENN.

THE ideal appliance for correction of malocclusion is a dream appliance. One which has never made its appearance. To think of any particular mechanism as a panacea for all ills is the height of folly. Many practitioners of orthodontia have their own favorite type of appliance for correction of malocclusion and are quite expert in the manipulation of that particular appliance; the results they obtain are most commendable. Each man should perfect himself in the use of a certain type of appliance, but he should be careful in the selection of this type and yet should not necessarily eliminate all others. There are many features he should take into consideration in the selection of any particular type of mechanism. Long established precedent in practice and literature seems at times to have such an influence over men as to be a barrier to progress. This is true with the practitioner who notices its truth in every day practice, yet he is reluctant to break away.

First of all he should bear in mind that he is working on a living organism, not only on *a* living organism but often on several, as each individual tooth in the arch is an integral part of a unit.

Bone develops as a result of mechanical stimulation. It is the mechanical stimulation derived from the orthodontic appliance which should produce the growth of bone. The ideal orthodontic treatment is a stimulation along functional lines, and the ideal regulating appliance is one which will cause this stimulation and yet will not interfere with functional activity of the teeth and surrounding structure.

Unlike inanimate structures, however, bone has the power of expanding upon demand; the shape and texture may be altered to meet the demands of stress to which it is subjected.

We believe that it is the consensus of opinion of the present day orthodontist that a light, constant, stimulating pressure applied within the physiologic limit is preferable to the intermittent application of force. The modern conception of tooth movement is far different from that held in the earlier days of orthodontic practice.

In this paper we hope to describe what we consider the nearest to the ideal appliance for the correction of malocclusion.

It possesses all the essentials of stability of attachment, strength, delicacy, and inconspicuousness. This mechanism is more comfortable for the patient and easier to keep clean than most forms of labial appliances. Time will not permit going into minute detail concerning the construction of the anchor bands

*Presented before the Second International Orthodontic Congress, London, July, 1931.

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and lingual and labial appliances with auxiliary spring attachments, but a few vital points are necessary, which we shall mention.

The basis of all orthodontic appliances is the stability of anchorage. Without this important step taken care of at the start, the treatment is headed for failure.

One of the most important parts of anchorage is the construction of the anchor bands. First the qualities of the material of the anchor bands should be considered. They should be of a material that will withstand the forces brought to bear upon it, and it should have enough resiliency to be fitted properly upon a tooth.

The band should be made to fit the tooth. It should be carefully scribed and festooned to follow the curvature of the gingival line, extending slightly under the free margin of the gums and occlusally to the point so as not to interfere with the stress of mastication, and finally polished to prevent any irritations that might be caused from unnecessary rough edges.

SOLDERING OF TUBES

The soldering of the half-round tubes is so important that we shall give a few vital points in this operation.

Maxillary Tube.—After the bands are well fitted, remove them; grasp the band on the buccal surface around the soldered joint; place a small quantity of 18K solder on the band at the center of the lingual side; grasp the tube with a pair of tweezers, and holding the tube against the solder at an angle of 5 degrees and within 0.022 inch of the gingival margin. The occlusal margin of the tube is slightly nearer the anterior surface of the band. Hold the band and tube over the flame and unite them. The tube is placed close to the gingival margin to avoid interference from the occluding cusp of the opposing mandibular tooth, and at an angle to compensate for the posterior inclination of the molar.

Mandibular Tube.—The mandibular tube is placed parallel to and level with the occlusal margin of the band when the teeth are in normal relationship; but, where the maxillary teeth are in lingual occlusion, the tube must be placed nearest the gingival margin to avoid interference from the occluding cusps of the opposing maxillary teeth.

Now replace the bands on the teeth preparatory to taking impressions with modeling compound.

IMPRESSION

An accurate impression is absolutely essential to a well fitting appliance. Place modeling compound in a tray, carry it to the mouth and seat the anterior portion first. Then slide the fingers posteriorly, press that portion into position, and when thoroughly hardened remove. Take care in removing the bands that they are not distorted, and then seat them in the impression, waxing them into position. Box the impression and pour with a hard stone thoroughly mixed. Allow to harden and separate.

THE LINGUAL ARCH

The lingual arch occupies a position on the lingual surface of the teeth at the gingival border which leaves all the teeth free to function normally, except

the molars to which the bands are attached. To the lingual arch are attached various types of auxiliary springs which develop forces operating from the lingual side and are in direction of normal growth, leaving the muscles of the lips and cheeks to function normally. The secret of success in retention of orthodontic cases is the establishing of occlusion, or cusp relationship between the maxillary and mandibular arches. In the use of the lingual arch with auxiliary spring attachments the teeth have a far greater chance to establish this relationship, than when they are held in force by a more rigid appliance. The movement by use of the auxiliary springs is more of a stimulation than a force, which aids in the developing of the bony structures. It has been proved that a slight stimulation by means of a small auxiliary wire is capable of moving teeth and causing bone growth. It has also been proved that force cannot move teeth unless life processes are at work. For instance, in the cadaver no amount of force applied by an orthodontic appliance can move the teeth, while in the living organism the slightest pressure is capable of moving teeth. So bear in mind that you are working on a living organism, and that a great amount of force is not necessary to cause tooth movement.

It has likewise been proved that a great amount of pressure will cause bone atrophy, with the resultant loss of tooth and bone structure.

There is no question but that the lingual arch with auxiliary spring attachments gives a greater possible amount of latitude toward natural processes than any other form of appliances, and allows the teeth to assume a more natural position in the dental arch. At the same time it allows the correlated structures to assume a more natural position and adaptation.

The orthodontist must bear in mind that there is a physiologic limit to which he may aspire and that he can go no further, that every case is an individual case, and he can go only so far, but when this limit is reached he is through. What is normal in one case is not normal in the other. Every individual has his own normal, and we should not try to pass the individual normal in the correction of any case of malocclusion.

The all important part of the lingual appliance is not so much the technic of its construction as the manipulation of the appliance after it has been constructed. Most of the failures of the lingual appliance can be blamed on the faulty construction and improper manipulation, rather than on the appliance itself.

The lingual arch wires are of two varieties, the fixed lingual arch and the removable lingual arch. The fixed arch has no provision for its removal except by removing the anchor bands, since it is soldered to them. Adjustment is made only by manipulating the main arch wire, or sometimes by the use of auxiliary wires, but it is often used to stabilize the anchorage when the labial arch wire is used. However, it is the removable type of lingual arch that we shall describe.

To manipulate the lingual appliance properly it should be constructed with the greatest degree of accuracy that the operator is capable of attaining. We shall give a little thought to its construction, starting with the material used. In selecting the materials and sizes of wire, use the smallest variety that is possible to carry out the intended purpose. The following sizes have been found to be most suitable:

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The size of posterior band material	0.007 × 187.
The size of anterior band material	0.005 × 187.
Half-round tube 0.10 in length.	
Round tubing to fit 0.020 and 0.022 wire for anterior bands.	
For labial and lingual arch wire	0.040.
For intermaxillary hooks	0.035.
For guide planes	0.030.
For lock wires and labial springs	0.022.
For auxiliary springs	0.020.
For most soldering purposes	0.656 fine.
For auxiliary spring soldering	0.437 fine.

THE SOLDERING TECHNIC

One of the most important steps in the construction of any appliance is the soldering technic. Much depends upon the success of this operation.

No doubt it is a mistake to specify solder by karat or even by number, but at the present time we have very little choice and no other course of procedure. It seems to us that the proper basis upon which to specify solder would be according to melting point, strength and ductility. The upper melting range of solder to be used with given gold should certainly lie below the fusing temperature of the gold as shown by the wire method. How much below is a matter upon which we shall have to make a final decision. We have tentatively suggested 100° Fahrenheit at times; whether more or less spread than this would be required would depend somewhat upon the skill of the operator. After this requirement has been met, the further selection of the solder would be specified by the best strength obtainable with a minimum permissible ductility. What the minimum ductility should be is again a question; therefore, we do not believe that solder which is best for one gold is necessarily best for another. When the solder alloys with the metal soldered, this alloying process undoubtedly unbalances the metal affected, thus changing the properties of both the solder and the metal being soldered. It would seem then that eventually solders would be specified as best suited for a given gold alloy so that their mutual properties might be affected as little as possible in the soldering operation. We believe that the soldering operation should be completed as quickly as possible, that joints should be as thin as possible, that the parts to be soldered should be pressed together as tightly as possible and held in contact until they cool slightly, and also that no bending of wire should be attempted until the wire has completely cooled.

THE LABIAL ARCH

The labial arch is often used in conjunction with the lingual arch. It is safe to say that it is almost always used, especially if the case is one in which the principle of anchorage is in doubt. The labial arch is not a new appliance and at the present time is used in three different positions, high, medium and low. The high and medium labial arch is an ordinary expansion arch placed beyond the gum line instead of across the teeth, force being delivered to the teeth anteriorly to the anchor teeth by means of various forms of spring extensions, and the arch itself being used for the movement of the anchor teeth. It

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is absolutely essential that the comparative size and rigidity of the labial arch wire be sufficient to prevent its displacement by the reaction of the spring extensions when they are delivering pressure to the teeth. The low labial arch wire lies along about the gingival margin or a little below and is used in conjunction with ligatures.

The principles of the labial and lingual arches with auxiliary spring extensions are similar, and the combination of the two extends the range of simple contact treatments beyond that of either one alone. Alone or in combination (using bands when necessary) they have important mechanical advantages over appliances having a multiple of bands closely attached to an arch or base wire, and are radically different in principle. Re-alignment of the base wire is seldom necessary. Consequently the anchor teeth are not subjected to changing reactions. With the high labial arch, individual force delivery is used, thus giving greater accuracy of individual tooth movement. The avoidance of bands when possible is a decided mechanical advantage, as their presence in interproximal spaces takes up valuable space needed for the accommodation of the teeth in the arches. The above mentioned outline briefly recommends the lingual and labial arches with auxiliary springs for the following reasons: first, simplicity of design; second, efficiency in operation; third, stability of anchorage base from which to deliver force; fourth, individual tooth control; fifth, unchangeable in form while in operation.

AUXILIARY SPRINGS

The auxiliary springs are, generally speaking, the agents that do the actual work. It would be interesting to determine definitely the minimum pressure capable of provoking the resorption of bone. Unfortunately we have no information on this subject, but we do know that a slight pressure is capable of causing tooth movement. The lesson to learn from this is that the degree of force applied and the frequency of application are of greatest importance. The auxiliary springs after they are adjusted should not be adjusted again until the teeth have moved beyond the force of the auxiliary springs. This will influence the frequency of application, depending upon how that particular case will respond to treatment.

But orthodontic treatment should not be continuous. The case should have frequent rest periods, which are taken as in stages of growth.

We should remember that our appliances are only an aid to create stimulation and that the natural process of growth is the all important factor.

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A SERIES OF X-RAY PICTURES SHOWING A HORIZONTALLY IMPACTED MANDIBULAR SECOND PREMOLAR, WHICH ERUPTED INTO NORMAL OCCLUSION, AFTER THE REMOVAL OF ALVEOLAR BONE*

O. Henry, D.M.D., L.D.S., London, England

I VENTURE to bring this series of x-ray pictures before you, because I feel that it may contain several points of interest to you, as orthodontists.

The patient, a boy, was eleven years old when the first x-ray picture was taken in May, 1928. His physician refused to allow a general anesthetic for the operation to remove the overlying alveolar bone; therefore, an attempt was made

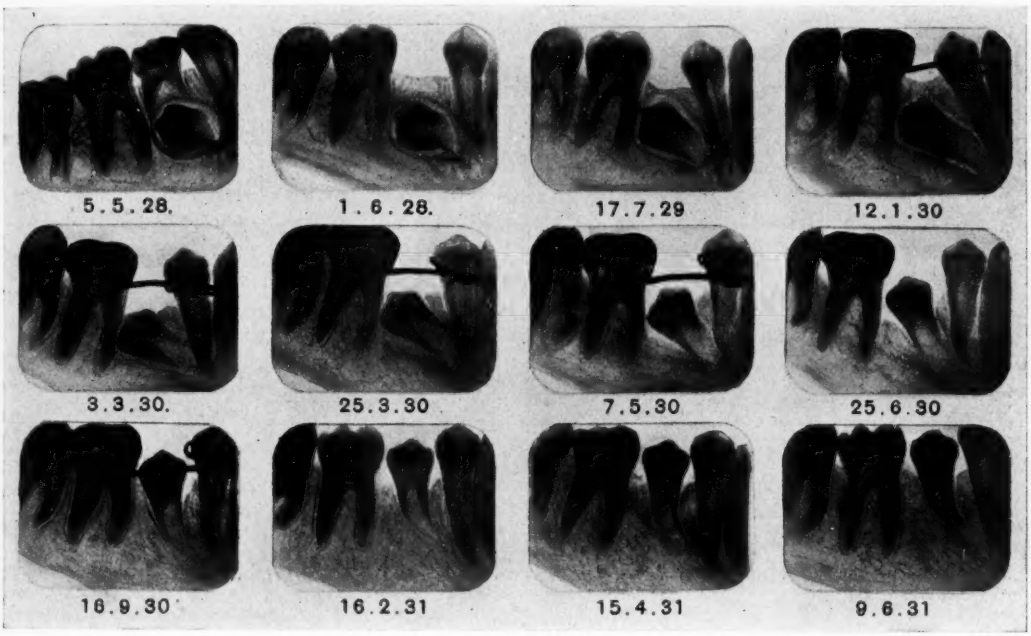

Fig. 1.

to remove the bone under a local anesthetic, but the boy collapsed and it had to be given up.

The case was kept under observation until January, 1930, a year and a half later, when his physician at last realized the seriousness of the situation, and agreed to a general anesthetic.

Film 4 shows that the developing tooth germ had tipped the first premolar so far that it was almost closing up the space. The entire mandibular arch had inclined distally toward that side, and the maxillary front teeth followed the movement.

The alveolar bone around the tooth was removed under a general anesthetic, on February 14, 1930, by Mr. Bowdler Henry, who assured me that if space

*A paper presented at the Second International Orthodontic Congress, London, 1931.

could be obtained the tooth would come into occlusion without the application of force. Orthodontic treatment of both arches was begun, and as the teeth gradually resumed their normal position in the arches, this tooth erupted into the space obtained.

The next point of interest is that the root did not begin to develop until a year later, February, 1931, when the tooth came into occlusion. This brings us to the question: Is occlusion the ultimate factor in the formation of the root? If not, then why did the root only begin to form after occlusion had been obtained?

The next point of interest is that the root is developing obliquely, along the curved path of eruption of this tooth, toward the original germ center. This raises the question as to what are the forces that bring about eruption, for the dental papilla is still situated far from the original germ center toward which the root is developing.

Lastly, the tooth is in complete torsion, which suggests that during its impacted state, the developing forces turned the tooth on its axis.

DISCUSSION

Mr. G. Northcroft, London, congratulated Dr. Henry on the careful recording of this case, which was one of considerable interest in the study of the development of teeth. He thought that the suggested theory that occlusion played a part in the formation of the roots of the teeth could be dismissed. The roots could be formed quite independently of eruption. He could not quite follow Dr. Henry's idea that the tooth had rotated in its crypt. He noted that the tooth began to erupt as soon as the deciduous tooth was removed, which seemed to show that the factor of absorption had something to do with eruption.

Mr Bowdler Henry, London, said that he would quote a case which showed that if a tooth was impacted by the overlying bone, the tooth would erupt of its own accord if this bone was removed. In 1924, he saw a little girl of nine who had the first mandibular molars removed because they were septic. In 1929 the second premolar had not erupted, and a radiograph showed that it was impacted against the second molar. He removed enough bone to expose the crown, and without further treatment the premolar came into place. He had recently seen two similar cases.

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GIANT MODELS*

By Charles A. Spahn, D.D.S., Newark, N. J.

TO many dentists, a tooth is merely a tooth—to others it is a beautiful work of art. Why the difference in point of view? Not because of the fact that the teeth themselves show any great degree of variation, but because the eye has not been sufficiently trained to grasp the intricacy of tooth form and design. The average dentist is too busy in repairing the ravages of destruction upon the dental tissues to have any time for searching study of tooth anatomy; and in the student years, that most important branch of education is sadly neglected.

These services of the dentist to his patients can be raised to a standard of inestimable value by an accurate knowledge of tooth anatomy and surrounding parts. The student's education, if it is to be of any great benefit to humanity in after years, must have at its very foundation a thorough understanding of this science.

How then can this subject be brought to the attention of the profession in an intelligent way? If one should attempt to search out the details of this subject in books such as Black's *Dental Anatomy,* it would mean a tremendous amount of study besides the difficulty most people have in visualizing the written description. As an illustration, take a paragraph from the above mentioned book in describing the maxillary first molar: "The central fossa is irregularly circular, and is formed by the central inclines of the mesial marginal ridge, mesiobuccal cusp, distobuccal cusp, mesiolingual cusp and oblique ridge. It is made irregular and sometimes angular, by the depth of the several sulcate grooves, or by the prominence of the triangular ridges, especially that from the mesiobuccal cusp. The central incline of the mesiolingual cusp is generally a plane surface, but is sometimes slightly concave, and in about a fourth of its examples, there is a low triangle ridge running from its apex directly to the central pit. In a few examples, two supplemental grooves or wrinkles arise from the mesial groove at about the center of its length, and run, one toward the mesiobuccal and the other toward the mesiolingual angle of the occlusal surface."

To how many dentists or students of dental anatomy would this description be sufficient without a model of the tooth in question before them to supplement the text? There is no question but that the understanding of this branch of dental science would be greatly facilitated by study of exact models of typically formed teeth. With this object in view, a model of a set of teeth of giant proportions has been carved and reproduced. This presents a magnified picture of each of the twenty-eight teeth in a normal denture, showing a typical tooth arrangement with the detail of cusp formation, and fissures worked out with great degree of care. It is not a model of perfectly aligned teeth but rather one

*A demonstration given at the Second International Orthodontic Congress, London, 1931.

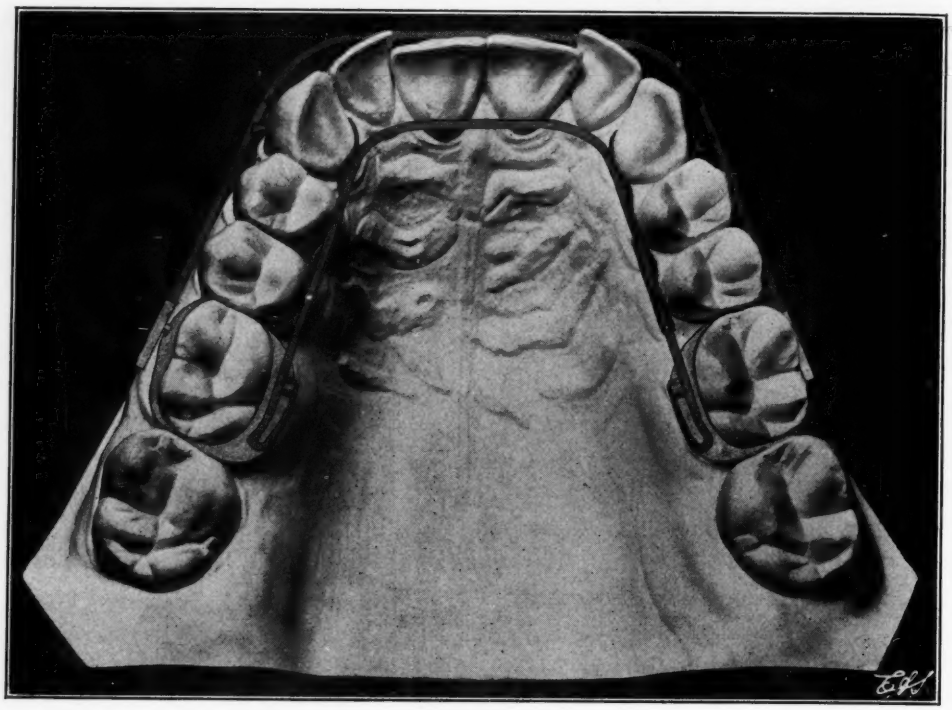

Fig. 1.

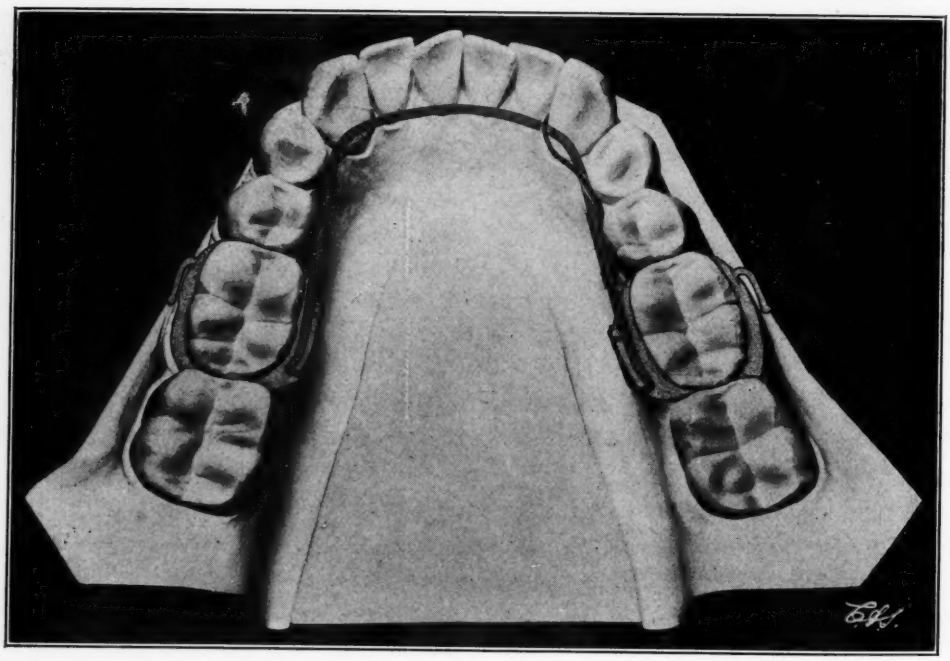

Fig. 2.

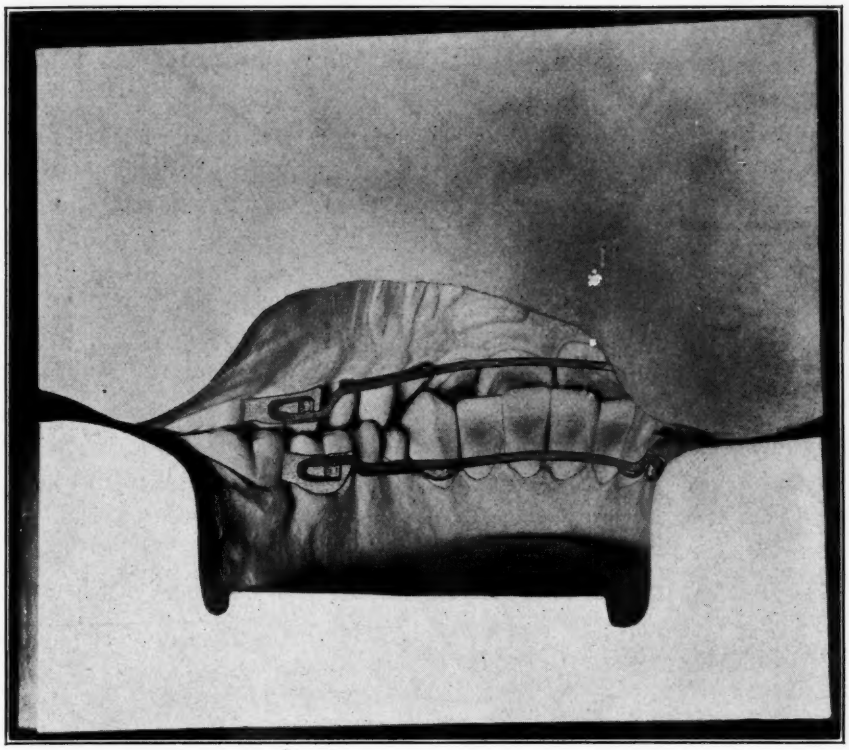

Fig. 3.

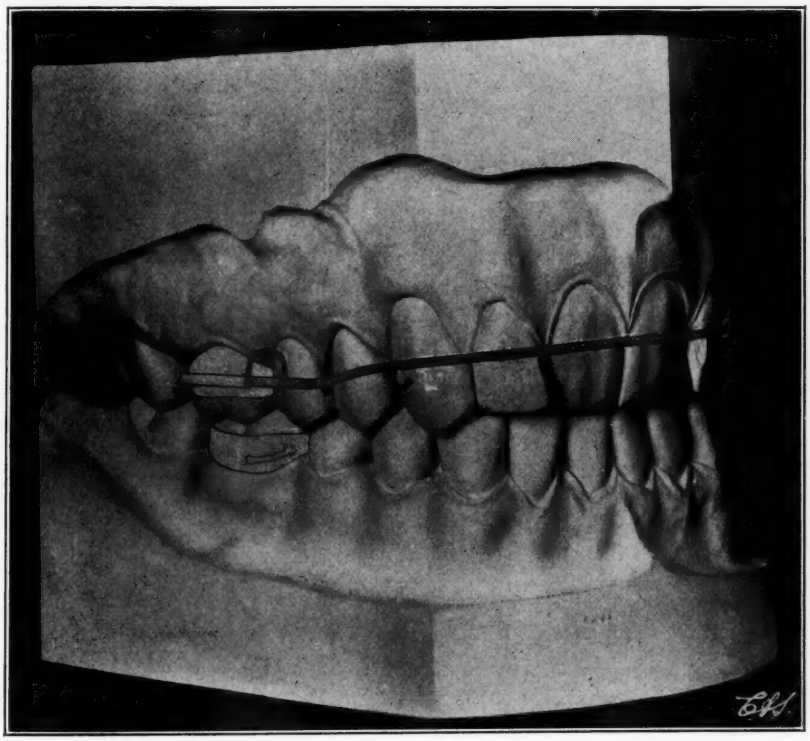

Fig. 4.

containing something of both the normal and abnormal, of physiologic and pathologic conditions, the pathologic conditions being produced by a slight constriction of the arches causing the irregularity of both maxillary and mandibular anterior teeth.

The maxillary and mandibular models have been made to articulate with each other in the most efficient manner for this particular set of teeth, not perfect because of slight irregularities. It also represents the soft tissues of the mouth showing the gingiva in both healthy and pathologic conditions—such conditions as would result from the use of the teeth in malpositions. This would of course be reflected in the supporting bony tissue about these teeth with the consequent destruction of the alveolar tissue (Figs. 1, 2, 3, and 4).

Because of the size of this model, these points are readily discernible. It would be possible to demonstrate the size, shape and position of fossae and ridges of individual teeth and to trace each line, groove or sulcus through its course from beginning to end. For this reason, such a model would be of great advantage to a student of dental anatomy or for the purpose of demonstrations in lectures on this subject.

Models carved by Charles A. Spahn, D.D.S., and text prepared by Mabel F. Thomas, D.D.S.

47 Central Avenue.

SOME HELPS IN ORTHODONTIC PRACTICE*

GUSTAV KORKHAUS, D.M.D., BONN, GERMANY

LIGATURE Pliers.—The ligature pliers (Fig. 1) have long, narrow, flat-pointed beaks which grip only along a few millimeters at their tip. The other part of the beaks is spaced out when the pliers are closed. The edges are rounded off, so that accidental pinching of the cheeks, lips or tongue is impossible. The pliers, through the action of a spring, grip tightly every tiny article (ligature or spring) but can be opened immediately by pressing. The handles are shaped so that they fit well in the hand.

Orthodontic Working Pliers.—The same pliers as the ligature pliers, but without the spring, suit all purposes of orthodontic work performed on the patient: the removal and the insertion of appliances, bending of the arch and small springs, etc. The finely pointed ends allow a firm grip on all parts. Pinching of the lips is impossible.

Fig. 1.—Orthodontic ligature pliers.

Diagnostic Orthometer.—(Fig. 2.) An inner disk of white Cellon, provided with figures, rotates very easily between two outer disks of the same material which have little cut out slots. After adjusting to the sum of the total width of the incisors, this instrument gives simultaneous reading for the respective normal figures for the transverse and the sagittal dimensions of the maxillary and the mandibular dental arches.

The orthometer is a part of a small case of diagnostic instruments. It contains a small precision compass for measuring the widths of the maxillary incisors and two celluloid symmetroscopes with centimeter and millimeter scales, which aid in the analysis of the models and the profile photograph.

With the help of the precision compass the greatest width of one of the four maxillary incisors is measured, and the sum is adjusted in the cut out slot *S. I.* by rotating the disk (see Fig. 2). Then without further manipulation the following normal figures (which are ascertained biometrically) can be read off at the different small spaces: (a) the anterior width of the dental arch, i. e., the distance between the first premolars; (b) the posterior width of the dental arch, i. e., the distance between the first molars; (c) the anterior length of the dental

*A demonstration given at the Second International Orthodontic Congress, London, July, 1931.

arch, i. e., the perpendicular on the line uniting the premolars and which course is directed to the labial part of the interdental space between the central incisors.

The length of the dental arch, which is very important in practice, is also measured at the same time as the width, with the help of a three-dimensional orthodontic compass, which I have constructed. From a study of the notes regarding the length and width of the dental arches the course of treatment is decided upon for the respective cases.

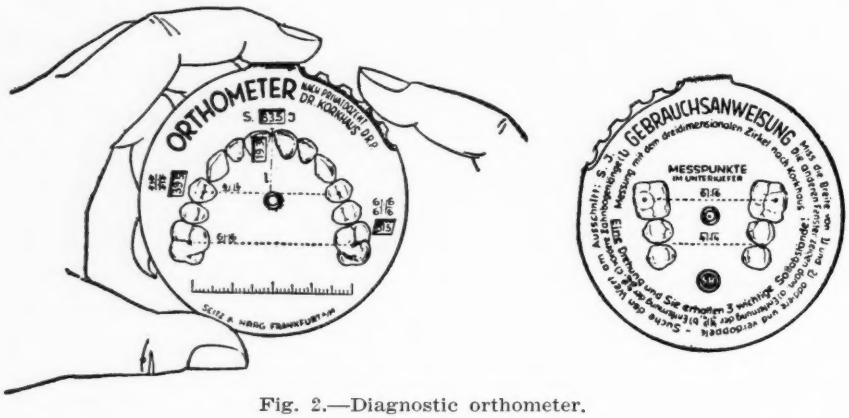

Fig. 2.—Diagnostic orthometer.

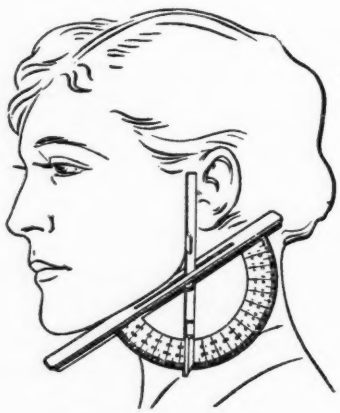

Fig. 3.—Goniometer.

Goniometer.—(Fig. 3.) A flat base, just like a ruler, is applied to the horizontal lower edge of the mandible, and an attached swinging sidepiece, running through a slot of the base, acts as tangent to the ascending ramus of the mandible. The degrees of the angle can be read from the graduated arc of the protractor (see Fig. 3). This instrument can be used on both sides of the face. The measuring of the angle of the mandible is an important step in examination for diagnosis. Measuring directly on the patient is to be considered the most exact of all proceedings. Ascertaining the angle of the mandible can determine the part the mandible plays in the origin of many anomalies, and can give valuable hints for treatment.

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DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

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LESIONS OF THE ORAL CAVITY AND OF THE JAWS AND THE REGION OF THE JAWS, INCLUDING THE TEMPORAL FOSSA, ORBITAL CAVITY, AND SINUSES*

JOSEPH COLT BLOODGOOD, M.D.
BALTIMORE, MD.

INTRODUCTION.—I have tried to picture the remarkable change that has taken place since I wrote a chapter similar to this in *Bryant and Buck's Surgery* (1907). We had some evidence then, but very little, of the extent of benign lesions and the earliest stages of the malignant. Today, if you live in an enlightened community, these benign lesions which may precede cancer or which have no relation to cancer will predominate in 60 or more per cent. Then will come the earliest stages of cancer, when diagnosis is most difficult, when x-rays and frozen sections are essential, when cancer is practically a microscopic disease, stages of the pathologic process where we need a differential stain to distinguish cancer cells from the cells that are not cancer. Unfortunately for this early stage of cancer difficult to differentiate from the benign lesions there is a grave difference of opinion as to whether the treatment should be radiation or operation. The second danger is that the introduction of diathermy, with its remarkably convenient cutting needle and its very efficient coagulation needle, has induced many members of the medical profession not trained in surgery to undertake to operate with these agents, when in almost every operative case it may be necessary to use some other form of cautery or the knife, for conditions may be exposed which demand the best developed surgical judgment and technic. I have attempted in every way to gather the evidence and not allow my surgical training to influence me against the value of x-rays, radium, diathermy and coagulation. I have used coagulation and diathermy from their first introduction and am familiar with their value. I am sorry to say that this

*This is the first of a series of articles by Dr. Bloodgood that will appear in the JOURNAL over a period of eighteen months to two years. Originally published in *Lewis' Practice of Surgery*, W. F. Prior Company, Inc., and brought up to date. The text will be accompanied by 212 illustrations.

value grows less as we gain more experience with them. Fortunately, I have had a very large opportunity to study and record the therapeutic value of x-rays and radium as employed by the most experienced in this country.

When we have an enlightened community and a properly trained medical and dental profession, the predominant lesion of the mucous membrane will be some form of local reaction of the mucous membrane to an irritant. Areas of irritation will predominate, and we must look for the causes in the teeth (ragged, dirty teeth and root abscesses), tobacco or snuff, some infection of the tonsils or nasopharynx, or some general disease, and Vincent's angina. When we see leucoplakia we know it is tobacco or teeth that cause it. When it is a definite local lesion, like a fibroma or a wart, we know there must be immediate local excision under local anesthesia with sufficient margin which is checked by immediate frozen section.

For lesions of or in the region of the jaws, the x-ray picture is the most important diagnostic aid. When there are no changes in the bone, but symptoms or definite swelling, biopsy will have to be performed, the surgeon being prepared in every way to go on immediately with the indicated operation. Members of the medical and dental professions must pay more attention to loose teeth, gum-boils and pain in the region of the teeth and jaw. Teeth must not be extracted, gum-boils or other swellings incised, or any little tumor around the gums excised without previous x-ray pictures, without being prepared for frozen-section diagnosis in certain cases.

I find that in the 65 per cent of the patients who come into my clinic for a supposed lesion in some region of the body other than the oral cavity and which lesion is not one for operation, a large percentage have root abscesses which have given no symptoms, or they have definite irritations of the mucous membrane of the mouth because of neglected teeth, tobacco, Vincent's angina infection, or overlooked infections of the nasopharynx and tonsils. We therefore have ample evidence that cancer of the mouth is a preventable disease, and most of the neoplasms of and in the region of the jaws give evidence of their presence when a cure can be accomplished without mutilation.

BRIEF SUMMARY OF THE PRECANCEROUS LESIONS OF THE ORAL CAVITY

It is very important for every member of the medical and dental professions to be familiar with these lesions because, when present, they may be the beginning of a possible cancer. Proper treatment at this stage always accomplishes a cure. The dentist pays too much attention to the teeth; the nose and throat specialist's vision begins posterior to the anterior pillar of the fauces. The old practitioner was interested chiefly in a coated, dry or moist tongue, or the blue line of lead poisoning along the gums, or the cyanotic appearance of patients with cardiac disease. For years, when surgeons examined the mouth, they found cancer in its last stages. It is remarkable for how many years leucoplakia excited little attention until cancer developed. It is only since the war that we really have become familiar with Vincent's angina, which is the most common cause of a sore mouth. Ulcer, wart, hypertrophied papillae at the base of the tongue, fibroma, adenoma of the labial glands, angioma have excited no interest of patient or doctor until the lesions had become malignant or large. In

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older literature there are more references to "geographic tongue," which has no relation to malignancy, than to leucoplakia, which is the chief predecessor of cancer. Ranula, a form of cyst in the floor of the mouth, which is not only a very rare but a very innocent lesion, is described in its three forms in all textbooks of surgery, and twenty-five years ago was the most common examination question. The possible relation of a loose tooth, gum-boil or epulis to the beginning of a malignant tumor of the jaw has been recognized only very recently, although I find it recorded as an uninterpreted fact in all the histories of malignant lesions of the upper and lower jaw and oral cavity since the first history in the Johns Hopkins Hospital in 1889. Teeth are extracted, gum-boils incised, swellings around the alveolar border incised or neglected without any one's giving the least thought to the possibility that these may be signs of malignancy in its very earliest stages. The x-ray examination as an instrument of precision is becoming firmly established. Yet, many teeth are extracted without an x-ray diagnostic film. Frozen sections for diagnosis at the time of the operation for lesions of the mouth are made in but a few clinics of the world. Yet, the x-ray and the frozen-section apparatus are essential instruments of precision for the proper diagnosis of lesions of the oral cavity, which allow cancer to be recognized in its earliest stages and guide treatment of all lesions of the oral cavity so that cures may be accomplished with the least mutilation. The salesmanship of the diathermy and coagulation cautery has been far better than that for the frozen-section apparatus, and many clinics are provided with this expensive instrument which without doubt is one of the best methods of attack, when they are not provided with a frozen-section outfit, which is the real compass for the direction of the attack.

Doctors and dentists should become familiar with the ordinary appearance and palpation of leucoplakia, Vincent's angina, fibroma, wart, papilloma, various types of ulcers—tuberculous, syphilitic—cancer, areas of irritation, subcutaneous nodules and cysts, adenoma, the different types of epulides, stomatitis, glossitis, fissured tongue, bulging teeth, the normal and hypertrophied papillae of the tongue, the normal and diseased appearance of the labial glands of the cheek, the changes in the appearance of the gum in pyorrhea and Rigg's disease. These are the common lesions of the oral cavity. Gum-boils, loose teeth, swellings of the alveolar border, swellings of the upper and lower jaw can be felt with the finger but must be interpreted from the x-ray picture or at the exploratory incision from a frozen section.

Leucoplakia.—The patient sees a white patch, but does not feel it. This callosity of the mucous membrane of the oral cavity is like a scale of white enamel on the moist, red, mucous membrane of the mouth. Such an area of leucoplakia, with the rarest exceptions, is seen only in the mouths of those who use tobacco in some form, including snuff, and, as a rule, the teeth are ragged and dirty. The great majority of patches of leucoplakia occur where the teeth come in contact with the tongue, lip or cheek, or where the chewing tobacco or snuff rests in the mouth. Now and then a patch of leucoplakia can be produced by the irritation of a tooth, especially one with a metallic filling. In about one out of two hundred cases of leucoplakia the condition is pseudoleucoplakia, which is due to a rare skin disease of the oral cavity, very difficult to distinguish

from leucoplakia except by its onset in youthful age, and, as a rule, the factors tobacco and bad teeth are not present. We shall not eradicate oral cancer from the human race until doctor and patient realize that the cause of leucoplakia is tobacco, and the only treatment is to stop tobacco in all forms, to clean and smooth the teeth. I am confident that the majority of individuals can smoke in moderation with very little danger of leucoplakia if they practice daily oral hygiene and see a good dentist at frequent intervals.

Vincent's Angina.—Next to ragged, dirty teeth and tobacco in excess the most common cause of sore mouth is the infection with the typical spirillum of Vincent's angina. The characteristic clinical picture is a red area with a central gray, opaque zone, as a rule. It could be easily called erysipelas of the mouth. It is never found in the mouth except when there are teeth, and the organism apparently lives in pockets about the teeth. It may extend to the lip and produce a fever blister to the cheek or the tongue, or even to the tonsil and pharynx. In a few instances there may be a single ulcer or multiple ulcers. The mottled red area with the central whitish or grayish patch or zone may be single or multiple, or diffuse. When it covers the tonsils or pharynx it may suggest, in appearance only, diphtheria. But such patients are never septic as in diphtheria. In every instance smears showing the typical spirillum will make the diagnosis. Patients with Vincent's angina have sore mouths in addition to what can be seen there. Patients with leucoplakia alone have little or no soreness. The infection of Vincent's angina may be present and complicate every benign and malignant lesion of the oral cavity. In many instances it is the only lesion. This infection itself is quickly cured by cleanliness, and the best drug is perborate of soda. Once a day the patient can place in the hollow of the left hand a teaspoonful of perborate of soda, place it in his mouth dry, let the saliva make the paste, and rinse the mouth for five minutes, take a toothbrush and brush the teeth with this paste, and then rinse with warm water. In addition, the teeth should be cleaned before and especially after eating, using the ordinary tooth paste and rinsing the mouth with some alkaline mouth wash, liquor antisepticus or some form of glycothymol solution. I have found it easy to teach patients to use mercurochrome at bedtime. Make a swab of toothpick and cotton, dip it in mercurochrome, paint the gums around all the teeth, give most attention where the gums are receding or where there are pockets, then let the saliva dilute the mercurochrome, hold it in the mouth for five minutes and rinse with warm water until the mercurochrome has disappeared. The only objection to mercurochrome is that it stains everything, but if you wait till bedtime and take your time you will learn the proper technic. For the first treatment of most cases of Vincent's angina the dentist should thoroughly clean the teeth, filling every cavity, cleansing every pocket, taking an x-ray film and extracting every tooth with a root abscess, replacing bridge work that cannot be kept clean with removable plates and teaching the patient the technic of continuing the treatment. The patients should report at frequent intervals until the disease is eradicated.

There is no relation between the infection of Vincent's angina and cancer. When an ordinary case of Vincent's angina resists treatment, look for infected tonsils, some nasosinus disease or adenoids, for some general disease like Banti's

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or general leucemia, for some vitamin disease of the type of scurvy, for deficiency in some internal secretion, for achylia. In about 5 per cent of cases of Vincent's angina which resist treatment, an additional cause is ultimately found. I have never seen Vincent's angina in a virulent form, although I have seen it diffusely affecting the oral cavity, fauces and nasopharynx.

Dentists can quickly teach themselves to recognize readily the spirillum on the cover slip under the microscope. Two of the most overlooked factors are concealed pockets in the gums about the teeth and small painless cavities beneath bridge work and gold filling.

Area of Irritation.—Here the patient complains of a sore spot on the tip or the side of the tongue, or on the lip or the cheek, or on the gum, as a rule, where the tooth comes in contact with the mucous membrane, or the sore spot may be partially or completely beneath a plate. The sensations of which the patient complains vary. The pain may be sharp, stinging or dull; talking may increase the discomfort; highly seasoned food may make it worse. Sometimes nothing can be seen in this area of irritation. Sometimes it is a little red. In a number of these cases Vincent's angina is found in addition to an irritating tooth or an ill-fitting plate. These patients are almost immediately relieved by removal of the cause. But when the patient has the fear of cancer, the symptoms are exaggerated and the area of irritation does not disappear even when tobacco, teeth, plate and the spirillum are removed. In this group the fear of cancer is perhaps more marked than in any other group, and for this reason these patients need special psychic treatment and will not be relieved of their local condition until the fear is overcome. The more we talk on the danger of cancer of the mouth, the more we tell people that a sore spot or a white patch may be the beginning of cancer, the more frequently are we to see areas of irritation with the fear of cancer. Yet when these patients are properly examined and properly talked to and all the possible factors of irritation removed, both areas of irritation—in the mouth and in the mind—promptly disappear.

I want to call special attention to the most marked area of irritation. This is due to the pressure of an ill-fitting plate, and the red area of mucous membrane is distinctly outlined. The plate should be removed at once and never replaced until the lesion has completely disappeared; then there must be a new plate.

Area of Irritation Due to Radium.—There is no question that people are being very well educated, and they are coming to physicians and to clinics with the earliest stages of the lesions of the mucous membrane. Unfortunately, radium is being widely distributed, and when radium is in the hands of one who cannot recognize leucoplakia, Vincent's angina, areas of irritation or hypertrophied papillae, the patients are liable to get radium instead of the removal of the cause. In the past two years I have seen a number of what may be called areas of radium irritation—the first stage of a radium burn. The original lesion had always been benign, and the resultant one was worse than the original. The red area of the radium burn resembles the red area of pressure from the ill-fitting plate, except at the line of demarcation there is a narrow red line and beyond this a zone of mucous membrane covered with a gray exudate. It is not unlike the typical picture of a gumma except that in the gumma the central

area of irritation is yellow. These radium burns take months to heal. The most soothing treatment is frequent rinsing of the mouth with a solution of bicarbonate of soda and twice daily painting the spot with mercurochrome. The radium treatment may cause the leucoplakia to disappear, but it has no effect upon the general leucoplakia, and we must remember that when a smoker has leucoplakia it is more important to get rid of the tobacco than of the leucoplakia. If we get rid of the tobacco, we remove the cause of cancer.

The indication for any treatment of the leucoplakia is cracking, scaling, wart or ulcer. Then it is safer to burn the area out than to treat it with radium.

Hypertrophied Papillae of the Tongue.—For practical purposes this is an area of irritation at the base of the tongue where the papillae are most marked. When the average patient sticks out his tongue, the average doctor does not see the papillary area, so that most doctors are not familiar with the normal appearance of the papillae at the base of the tongue. Given a correctly informed adult, man or woman, who suddenly has a sensation of soreness at the base of the tongue and then goes to the doctor, who for the first time sees a patch of red hypertrophied papillae and who does not take a smear for Vincent's angina, and who does not observe the molar teeth opposite this area covered with tartar, or who fails to look for infected tonsils or pus dripping from the nasopharynx or observe the other evidence of excessive tobacco, this patient in the early years of our educational efforts had a piece cut out for microscopic diagnosis, while now he gets radium treatment without any diagnosis, and then there is a radium burn. I have a number of such cases. Fortunately, the number of cases in which there has been no treatment is the largest, and as cancer and syphilis frequently have their primary lesion at the base of the tongue in this area of papillae, one must make the differential diagnosis. In the first place, get a better view, pull the tongue out with a bit of gauze, retract the cheek, look at the area with the cold Cameron light. You can always see ulceration which is never present in an area of irritation and hypertrophied papillae of the tongue. Palpate the area with your finger for the induration of cancer or tuberculosis. Exclude infected tonsils, nasosinus infection. Make smears for Vincent's angina. If the spirillum is present, start your treatment. Clean and smooth the teeth, stop all tobacco while the investigation is going on, remove all possible causes. Allay the fear of cancer. Take a blood Wassermann; when this is positive, give salvarsan. Make a physical examination and look in the x-ray pictures for signs of pulmonary tuberculosis. Then, when all possible factors are removed, you can begin to think of splitting the cheek and excising the area for frozen section. But this is rarely necessary. The benign and the early stage of cancer are easily differentiated. Now and then a primary syphilitic lesion or an early tuberculous infection may require a biopsy to differentiate it from cancer, but a biopsy with frozen section, to be followed at once by the complete local removal if the section shows cancer. I have had one syphilitic lesion at the base of the tongue which I could not differentiate from cancer. It had passed the stage of hypertrophied papillae. The Wassermann was positive. It was my opinion that it was safer to do a biopsy. The patient, however, took the risk and the salvarsan. In three weeks the lesion had disappeared. Had it been cancer he might have lost his life.

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Hypertrophy of Labial Glands in Mucous Membrane of Oral Cavity.—The cysts and adenomas of the mucous glands, especially of the lower lip, have been known even before we had educated the public to come at once if they observed a white patch, a sore spot or a nodule in the mouth, and it is more than ten years since I published an article on keloid tumors of the lower lip. But only in recent years have I seen many examples of an exaggerated appearance of these glands throughout the mucous membrane of the mouth, especially on the cheek. These cases are convincing evidence that people are getting information and that the dental and medical profession are looking at the mouth more critically. In their first impression, they think they are observing things they have never seen before. Perhaps they have never seen them before, but conditions were overlooked because the vision of both professions was taken up with a fully developed local lesion, usually cancer. In many mouths the little glands are visible beneath the red mucous membrane as dots and oblong sausage-shaped yellow and grayish-white areas. They cannot be felt but are seen shining through the transparent epidermal layer of the mucous membrane. They remind me of the lacteals that one now and then sees shining through the wall of the small intestine near the mesentery when the abdomen is opened, usually for stab or gunshot wounds, within two or three hours after a full meal. These visible submucous glands of the oral cavity are not pathologic, but they must be borne in mind and differentiated from leucoplakia, Vincent's angina and areas of irritation. I know that they have no relation to cancer, but I have yet to find their diagnostic significance.

Stomatitis.—A diffuse inflammation of the mucous membrane of the mouth always accompanies the diffuse form of Vincent's angina, but the typical local lesion of this infection is readily seen in the inflamed mucous membrane. In the worst forms of diffuse leucoplakia associated with ragged, dirty, foul teeth, in addition to the diffuse white appearance of the mucous membrane, there may even be areas of redness and even an exudate. In most of these cases the secondary stomatitis is associated with Vincent's angina infection. Now and then we see diffuse stomatitis when there is no element like tobacco or extensive pyorrhea, usually associated with root abscesses. This type never gets well until the teeth are extracted. Infected tonsils and the dripping of pus from a naso-sinus infection in the posterior nares may produce this type of stomatitis in which neither tobacco nor Vincent's angina is present as the causative agent. The stomatitis that has no relation to tobacco and is not associated with Vincent's angina is very slow in its spontaneous recovery after the causative factors are removed, and these patients, should they have a fear of cancer, may become chronic invalids or neurasthenics because of the persistent symptoms—soreness, redness and whitish areas after the extraction of the infected teeth or the removal of the tonsils, or the drainage of the sinuses or the straightening of the septum.

This septic form of stomatitis present in the user of tobacco is often diagnosed leucoplakia, because white patches due to exudate are often present. These cases do not get well and are even not much improved when tobacco is discontinued, and are often quoted as examples of leucoplakia having no relation to tobacco.

When Vincent's angina is treated without bacteriologic evidence, this form of stomatitis is not relieved; and even when the smears show the spirilla, the specific treatment for Vincent's angina does not give the usual immediate relief because the factors of infections in root abscesses, tonsils or sinuses are still present. I am seeing more and more of this group. Such cases demonstrate how important it is that, in addition to a survey of the oral cavity including x-ray films of the teeth and cover-slip examination, there be a thorough inspection of the tonsils, nasopharynx and sinuses. The dentist needs the nose and throat specialist, and the latter needs the former. Both should be able to make the complete survey.

Glossitis.—A diffuse thickening and enlargement of the tongue has been observed chiefly with leucoplakia, with or without cancer, when the blood Wassermann was positive, and in tuberculosis of the tongue when the Wassermann was negative. In passing, it is interesting to note that the prognosis for a cancer of the tongue, no matter how small, is almost always fatal in diffuse glossitis with the positive Wassermann. My records show this to be true from the very beginning, nor have I been able to find any improvement since the introduction of x-rays and radium, including buried radium needles and emanations, with or without surgery.

Fissured Tongue.—Unless due to the scar of a previous operation, it is usually associated with stomatitis, especially luetic. I have not seen it present in tuberculosis.

Bulging Cheek.—Cancer of the cheek is more common in the fat than in the thin, because the accumulation of fat in the cheek pushes the mucous membrane between the teeth, and if there is leucoplakia with rough and ragged teeth, the opportunity for injury of the cheek is increased and with it the opportunity for the development of cancer.

Fat people with this complication should be unusually careful of keeping their teeth clean and smooth.

Fibroma.—It is remarkable how often this lesion is diagnosed leucoplakia when the subepidermal fibrous nodule is covered with thin, white, anemic mucous membrane, or cancer when the mucous membrane over the white nodule has ulcerated due to the pressure of the nodule or injury from teeth or plate. These nodules vary in size from that of bird shot to that of a pea. The cause is the same as a fibroma anywhere else—injury. Biting the tongue, cheek or lip is the most common factor. Therefore, fibromas are most commonly found in areas which can be bitten by the teeth. When they are observed elsewhere, the injury has been produced by a foreign body—a fishbone, a hypodermic needle in a tonsil operation, or a dental instrument.

In about 10 per cent of the cases of fibroma cancer has developed. For this reason, if the lesion is in a spot subjected to the constant irritation of the teeth or a plate, it should be removed at once with a good margin. If anywhere else, there is no danger in waiting a few months for possible spontaneous disappearance, which often takes place in keloid or fibroma.

Wart.—As the fibroma is a mass of connective tissue beneath the mucous membrane, so a wart is a mass of epithelial tissue on top of it. This area of epithelial hypertrophy is much more liable to develop into malignancy than

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the area of connective tissue hyperplasia. The most common cause of a wart in the oral cavity is leucoplakia, but now and then the warty growth may develop at once from the irritation of a tooth or plate or from the burn of tobacco or pipe without any evidence of leucoplakia. Warts should always be excised with a good margin, so that, no matter what the microscope shows, sufficient tissue has been removed. There is no way of telling whether the wart is malignant or not until the microscopic section is examined. Up to 1915 our records show very few warts and very few early cancers. Then we began to get more early cancers and a larger number of warts. Now the percentage of warts is greater than that of cancer, and the two together are much more numerous than fully developed cancer. This means that we are on the road to cure cancer of the oral cavity.

Ulcer.—Whenever you see an ulcer in the oral cavity think of cancer. If the ulcer is leucoplakia do not delay a minute, but excise it with a good margin. If the ulcer, no matter how small, has an indurated edge, excise it, although it may be tuberculous or syphilitic, or due to the pressure or injury from a tooth. If it is an ulcer, it is dangerous to delay to see the effect of removing the cause. Even though the Wassermann is plus, if the ulcer has an indurated edge, do not delay. The ulcer, rarely seen in Vincent's angina, has no indurated edge and reacts almost immediately to treatment. It is usually associated with other minute ulcers so commonly observed in Vincent's angina of an extreme degree. In pyorrhea there may be multiple superficial ulcers on the gum. But if there is a single ulcer, burn it out with the cautery and get enough tissue for microscopic study. Bear in mind that all these small ulcers of the mouth, no matter where they are situated, can be excised with a margin sufficient for cancer and, more important, sufficient for the cure of cancer, without mutilation, with far greater certainty of a cure than from radiation. The unfortunate thing is that these little ulcers are neglected because so many in the onset are not cancer and so many recover when the cause is removed with and without radiation. But when I see fully developed cancer today, I usually get the history of a neglected ulcer. I am confident that with few exceptions the best treatment for ulcer is complete excision—and at once! When the ulcer is so large that its complete removal would be mutilating, there must be biopsy, but there is not much chance of a cure for a cancer ulcer of the mouth, the complete excision of which means mutilation.

Tuberculous Ulcer.—As a rule it has no induration and an excavated edge, but when the tuberculous ulcer is small, it may have an indurated edge and should be excised like any other ulcer, whether the edge is indurated or not. As a rule the tuberculous ulcer is larger, and when of this size, it has a different edge and does not palpate like cancer and there is evidence of tuberculosis in the lungs. With this ulcer there may be stomatitis due to myositis around tubercles buried in the muscle. Sometimes, on account of induration, this is difficult to differentiate from cancer. Biopsy is always indicated because the lesion is large, and such examination settles the question at once. I have not yet observed cancer in tuberculosis of the tongue and oral cavity. Now and then it occurs in tuberculous lupus of the skin. The prognosis for tuberculosis of the mouth is good. There is practically always tuberculosis of the lungs, and the tongue is infected because of injury.

Syphilitic Ulcer.—The primary lesions are usually on the mucous membrane of the lower lip. All I have seen have been quite characteristic, with Wassermann plus and rapid healing—within ten days—after arsphenamine. I have not seen mucous patches within the mouth for years, but the typical patch is not at all like cancer. I have already noted one tuberculous area on the base of the tongue difficult to distinguish from cancer, as I have already called attention to the common association of cancer with syphilis of the tongue, stomatitis and gumma, and its bad prognosis.

Our records show a definite and marked decrease in the number of cases of lesions within the mouth in which the blood Wassermann is positive, and glossitis, undoubtedly the result of untreated syphilis and gumma of the tongue, has practically disappeared in the past ten years. Primary leutic lesions and mucous patches are becoming equally rare. Syphilis as a factor of cancer of the tongue, so prominent in the time of Butlin of London, is apparently under control in this country.

Pellagra.—Fifteen years ago, when pellagra was common in the South, I observed a few cases of stomatitis. It was a diffuse lesion and, of course, not difficult to distinguish from cancer. On one occasion only there was referred to me from a Southern state a man with glossitis with peculiar changes in the mucous membrane of the tongue. The lesion had come on while he had been confined to a penitentiary. The tongue had the appearance neither of cancer nor of tuberculosis. The Wassermann was negative. The x-ray pictures showed no lesion of the lung. We did not find the spirilla of Vincent's angina. The patient kept his teeth clean and did not use tobacco. While under observation vesicles and similar lesions broke out on the lower lip. For this reason we did not do a biopsy, but increased the vitamins and essential foods, which was followed by rapid healing of the entire lesion. I have no example of cancer of the mouth developing in one of these lesions of the oral cavity that may be associated with this disease.

Scurvy.—This allows a discussion of the entire subject of bleeding gums, in which scurvy is only one of the factors. The discussion belongs under Vincent's angina, and I have already mentioned that in some cases of sore mouths with or without bleeding gums in which the spirillum of Vincent's angina may or may not be present, there may be other factors, and when this is the case they must be found and removed before the lesion of the mouth will recover. The space of this article forbids a discussion of this rare group.

Leucemia.—Now and then in leucemia the gums are so swollen that the teeth are almost buried by the rising gum. It involves the upper and lower jaw and the tissue on both sides of the gum. Microscopically, beneath the epidermis there is a diffuse growth of lymphoid cells giving the picture of lymphosarcoma. The examination of the blood confirms the diagnosis. This condition of the gums in leucemia, in my experience, has appeared in only very few cases and then only a short time before death.

Subcutaneous Benign Tumors.—Practically everything we have discussed so far, except the hypertrophy of the labial glands and the fibroma, are lesions of the epidermal zone of the mucous membrane. Subcutaneous tumors here are rare and as a rule not difficult to diagnose nor to remove completely unless they

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are too large. The diffuse hemangioma and lymphangioma of the mucous membrane of the cheek, floor of the mouth and tongue may be so large at birth that one is tempted to try radiation first. My experience favors complete excision of these angiomatous tumors if it can be done without mutilation. In the latter event try radiation. If this fails, coagulation. They are rare tumors.

When a subcutaneous tumor reaches the size of a pea, it is safer to remove it. There is no way of distinguishing the fibroma from the adenoma or the dermoid cyst. In a number of instances of malignant tumors—both cancer and sarcoma—the patients have been aware of a small subcutaneous tumor for years. The most common situation of these subcutaneous tumors is on the lower lip, and it is best to leave them alone unless they get larger than a pea, as they often disappear with and without spontaneous rupture. When size or irritation demands removal, give them a good margin and have them studied microscopically, because, as stated before, keloids may develop in the scar and suggest malignant recurrences.

Ranula and Sublingual Salivary Glands.—One should be familiar with this region of the floor of the mouth. On each side of the anterior third of the tongue one can see and feel beneath the mucous membrane sublingual salivary glands and on each side of the middle raphé one will observe the papillae through which this and the submaxillary salivary gland ducts empty.

Recently one of my students sent me a Princeton student who just complained of pain, tenderness and bleeding about the papillae of the floor of the mouth on the right side. Nothing could be made out on palpation, there was no calculus, no spirilla of Vincent's angina. He was given an antiseptic wash and the lesion disappeared in a few days. It was not unlike bleeding from the nipple of the female breast, and it is possible that he may have a papilloma in the duct too small to be felt. It may disappear or later give rise to a tumor of the salivary glands of a type I have never seen before.

Calculi and the sublingual and submaxillary glands are not at all difficult to recognize on palpation or in the x-ray picture and are easily removed through the mouth. Ranula is a distinct submucous cystic tumor varying in size. There should be no difficulty in distinguishing it from sarcoma and cancer.

I shall not discuss the mixed tumors of the parotid. Their common situation is in the neck near the angle of the jaw, but they may occur in the cheek, hard palate, tonsil, or in the sublingual region as well as in the submaxillary. They are distinctly palpable tumors. They cannot always be differentiated from beginning sarcoma or other benign tumors of various types. They can be easily and properly removed without mutilation.

Rare Lesions of the Oral Cavity.—In the first twenty-five years of my experience with lesions of the oral cavity, the common lesion was cancer. Today the lesions which I have just described are much more frequent than cancer; in fact, the nonmalignant lesions of the oral cavity have increased in my experience from 3 to 65 per cent. Something new that is not malignant is coming under observation every month. When we gave a clinic in Farmville, Va., not long ago, there appeared a boy of nineteen with what at first appeared to be leucoplakia of the oral cavity. It was too diffuse for leucoplakia. Against leucoplakia was that it had been present since birth, that he had never used

tobacco and that most of the members of his family suffered from the same condition. I had no opportunity to go further into the diagnosis. Doctor Bedford Shelmire[1] before the section on Dermatology of the Southern Medical Association gives a very clear description of what he terms certain diseases of the oral mucous membrane and vermilion borders of the lips. He speaks of them as nonsurgical conditions of the oral cavity. He mentions the raspberry tongue of scarlet fever, Koplik spots of measles, the oral hemorrhages, ulcerations and infiltration of the various leucemias, the glossitis of pernicious anemia (this I have never seen), the ulcerations of a granulocytic angina, the stomatitis of pellagra, the hemorrhages of scurvy, the pinhead white oral tubercle of miliary tuberculosis (this I have never observed), the petechial hemorrhages of bacterial endocarditis. He then describes very fully the stomatitis that may be produced by drugs—mercury (we have recently had such a case which extended to a diffuse periostitis with ultimately the loss of all the teeth and some sequestra), arsphenamine, bismuth, the entire antipyrin group. In the past year, since we have been using intravenous lead for cancer, we have observed the blue line on the gum in most of the cases, but rarely stomatitis. This may have been prevented by our constant supervision of the cleanliness of the mouth.

This demonstrates that in stomatitis we must look for a drug as the possible cause. I have not observed peculiar vesication and herpes and erosions that Shelmire pictures as associated with the menstrual period; they may be very marked on the lip. The gingivitis gravidarum we do not often see now because our patients are under good dental care. But one should be familiar with the oral lesions which are transitory during pregnancy. He describes well and illustrates clearly thrush, macroglossia mycotica and other lesions of the mouth due to fungi or yeast. I have only recently seen one such case, which at first was taken to be leucoplakia. Blastomycosis of the oral cavity I have not observed. I know of no other article in recent literature that describes better these rare conditions of the oral mucous membrane.

These lesions are diffuse and as a rule would give no difficulty in the differentiation from cancer, but in view of the common occurrence of leucoplakia and Vincent's angina they may receive the routine treatment of the discontinuation of tobacco in all forms and perborate of soda, when they may disappoint both patient and doctor by not rapidly responding.

Cancer.—Those of us whose surgical experience goes back twenty-five years or more know what late cancer of the mouth means. It means a hopeless condition in more than 50 per cent of the cases and a chance of curing the disease in less than 20 per cent. Far better results were obtained in cancer of the lips than of the tongue, and in the gum and hard palate far better than in the cheek and soft palate. I have no evidence that radium treatment in any of its forms or x-ray radiation has increased the number of cures. Radiation offers palliation when surgery offers nothing but mutilation. Only the ignorant and uninformed should die of cancer of the mouth. When the correct information in regard to hygiene of the oral cavity is properly disseminated, dentists and physicians will be swamped with the types of lesions which I have just described, and cancer will then appear as an innocent local lesion in the type of a wart or an ulcer. Mouth lesions will then be in one of two groups. In the larger,

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the cause or causes will be found and removed, and the lesion will disappear. In the smaller, the local lesion of the character of a wart or ulcer will immediately be properly removed with a knife or cautery in such a manner that if the microscope shows beginning cancer, no further operation will be necessary.

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(To be continued.)

ACUTE INFECTIONS ABOUT THE JAWS OF DENTAL ORIGIN

Dissection of the Closing Muscles by Pus (Four Illustrative Cases)*

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ACUTE infections about the jaws are usually the result of some form of peridental inflammation, and there is frequently associated some form of dental trauma or extraction.[1, 2, 3] Neglected dental caries in which shells of teeth are left with direct avenues into the bone for contamination is the main offender for the spontaneous cases. There are innumerable infections that develop under flaps of gum tissue overlying third molars, but these seldom go on to severe cellulitis or abscess formation unless there has been some trauma, surgical or otherwise.

There may be a rapidly developing widespread cellulitis of the soft tissues with an overwhelming general infection from which the patient dies in from two to eight days; or the infection may progress to abscess formation, and drainage of the soft parts may be all that is necessary for treatment.

Bone involvement may occur from the acute soft tissue process, and there may be widespread denudation of the periosteum. In these instances it seems that much of the jaw bone will be sequestrated, but fortunately there may be complete healing without the loss of any bone.

The typical bone involvement is usually of slower onset than the acute soft tissue infection and of itself causes a soft tissue involvement. This type goes on to block necrosis of bone and sequestration. There is one other type of low grade infection in which there is a complete absorption of the infected bone and sequestra are not found at any stage.

As a general rule, it may be said that the acute swelling, pain and infection that immediately accompany some form of dental trauma are caused by a cellulitis of the soft tissue, whereas the true bone involvement is slower in development and may not give marked signs of inflammation for ten days.

In a series previously reported,[1, 2] we found the mandible involved four times as often as the maxilla. In a larger series observed since, there is even greater preponderance about the mandible. This is probably a simple matter of drainage and may be applied either to the spontaneous cases or to those associated with dental trauma.

The bacteriology has been studied in most cases without any very important findings. If foul pus is evacuated, it may be assumed that a communication with the mouth exists. Mixed organisms are usually found, and, if quantitative cultures are made, the predominating types are determined. Not infrequently no organisms are grown on culture. This may be due to late drainage of the pus

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after the death of aerobic organisms has occurred. Both aerobic and anaerobic cultures should be made.

In two of these four cases, no growth was obtained; in one case, only *B. diphtheroids;* and, in the first case, no culture was made because of gross contamination with the mouth.

Incisions of these infections should be dependent ones, preferably below the jaw. One important anatomic structure in the field is the inframandibular branch of the seventh nerve. This leaves the lowest division of the nerve usually just below and behind the angle of the jaw, and crosses over the lower border along with the facial artery. Section of it paralyzes the lower lip and creates a noticeable deformity. When incising this area, the scalpel should stop when the first fascia is reached. The deeper dissection should be done with forceps or by spreading open scissors, and all stretching of tissue should be in the general direction of the nerve fibers.

The line of the skin incision should follow the line of skin tension; this is always a slightly curved or collar incision, generally transverse.

When one considers the seriousness of and the possible limits of suffering and debilitation from these infections, it seems clear that great care should be taken in the early handling of even simple inflammations about the teeth. And it is necessary to realize that neglected dental caries, the infections about erupting third molars, and the extraction of teeth are definite surgical subjects that require close study and care.

Case 1. *Dissection of the closing muscles of the jaw, by pus from an acute dental infection.* A man of forty-five years was brought to the hospital seven days after having had a loose, sore, left mandibular tooth pulled under gas anesthesia. There had been almost immediate pain and swelling, and these had steadily progressed. No special treatment had been given.

Examination.—The patient was extremely sick and in great discomfort. The face was diffusely swollen, the eye closed, and there was a point just in front of the ear almost ready to rupture. (Fig. 1.)

Evidence of general debilitation was a relatively low white blood count, 8200, and a temperature that was not excessively high, 38.7° C. (101.6° F.). The Wassermann test was negative.

Treatment, First Operation.—Under light chloroform analgesia, it was found that the buccal mucosa was so swollen and necrotic that rupture of it occurred while examining it, with the escape of a large amount of foul pus. Exploration with the finger showed the cheek full of necrotic tissue and cavities, and the skin in front of the ear extremely thin. This was opened and a more dependent opening was made under the jaw and the two were connected. Bare bone all about the angle was felt. The resulting large cavity was packed lightly with iodoform gauze. (Fig. 2.)

Course Following First Operation.—It was believed that the infection from about the tooth had spread from the bone into the masseter and internal pterygoid muscles and that the periosteum had been stripped up or entirely lost.

With the immediate drop in temperature to normal the following day it appeared that the process would subside, perhaps leaving some osteomyelitis that would require prolonged drainage (Chart 1).

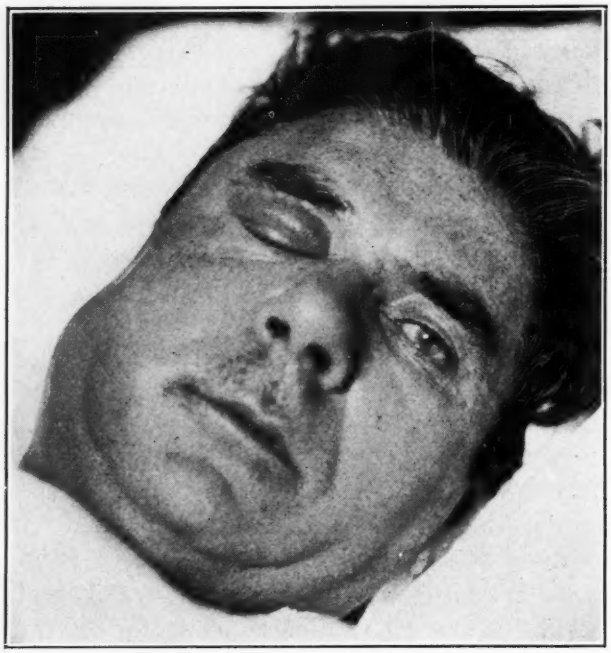

Fig. 1.—Patient shown eight days after tooth extraction. Eye tightly shut. Cheek tense, fluctuant, red and painful. Paralysis of the seventh nerve. Inside the mouth there was so much swelling that the remaining teeth had caused necrosis of the mucosa.

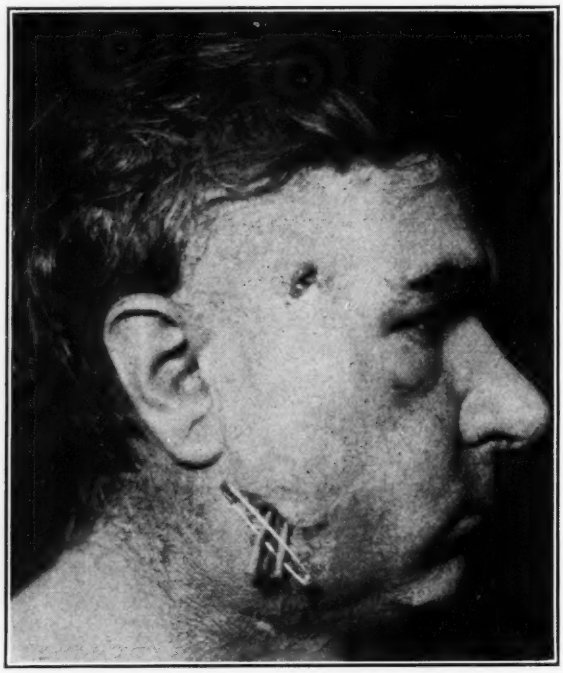

Fig. 2.—Same patient fourteen days later. The location of the three drainage points is seen, one under the jaw and one in the temporal region almost healed and one with the drain, which is protected with a safety pin. This drain later proved inadequate for the infection of the zygoma, and a small sinus was maintained under the eye.

When these incisions are first made, the cavities are packed loosely with iodoform gauze. This controls hemorrhage which might be severe, and it gives the cavities a good chance to wall off in a single pocket rather than permitting the formation of septa. It is removed in twenty-four to forty-eight hours, and the wound kept open with more gauze or soft rubber drains.

Stiff rubber tubes are never put in this region for fear of a pressure necrosis of the seventh nerve.

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However, the temperature rose steadily and the general improvement was short-lived. On the next day still further general debilitation was found, with a heavy content of sugar in the urine and a blood sugar of 233 milligrams. The definite diagnosis of diabetes was withheld until the fever was controlled.

On the sixth day it was definitely established that there was a subtemporal abscess, and with this formation there was the completion of the dissection of

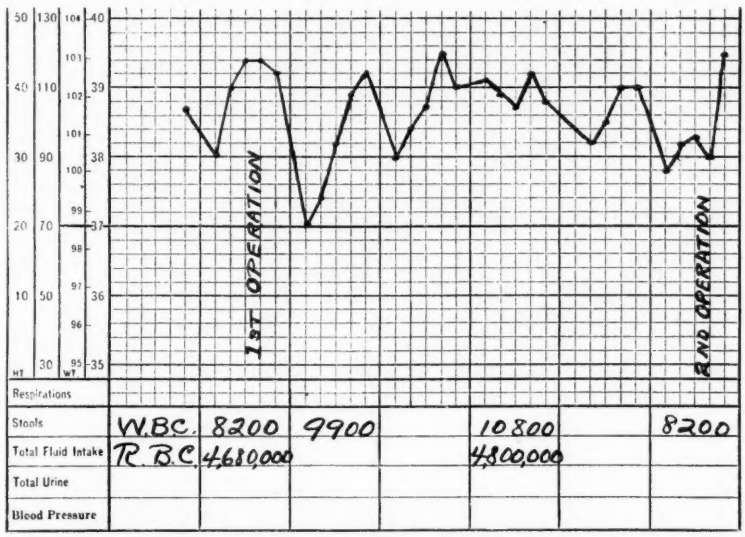

Chart 1.—(Case 1.) First week in hospital (second week of infection). Shows moderately high temperature, with a short-lived return to normal after first drainage operation, then prolonged elevation until second operation. The momentary rise following the drainage of the temporal fossa is taken as a result of the operation in opening new channels of absorption. The white blood count is only slightly elevated.

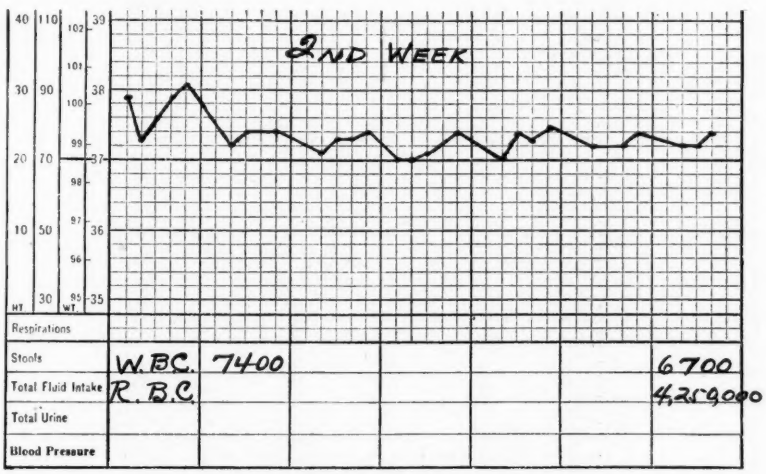

Chart 2.—(Case 1.) Showing the rapid return to normal after the final drainage of pus.

the main closing muscles by pus. It was believed that the avenue was up the jaw to the coronoid and from there into the temporal muscle.

Second Operation.—Under chloroform analgesia external drainage of the temporal fossa was established, and all three openings were connected. It was found that there was also an osteomyelitis of the zygoma, the route of extension having been through the masseter muscle. (Fig. 2.)

Result of Treatment.—On Chart 1 it will be seen that there is a rise in temperature after the second operation for one recording. This is not infrequent following the trauma of an incision, especially if much manipulation has been done.

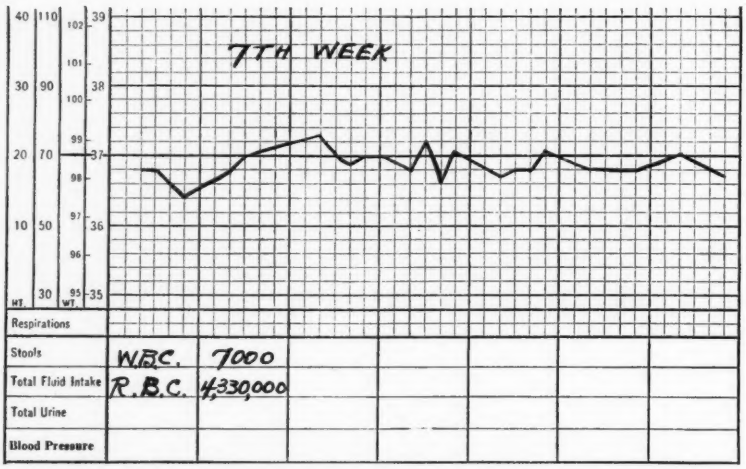

Chart 3.—(Case 1.) Showing continued normal temperature, without recurrence of fever, during which time drainage of the infected bone through the soft tissues is maintained. (Figs. 2 and 3.)

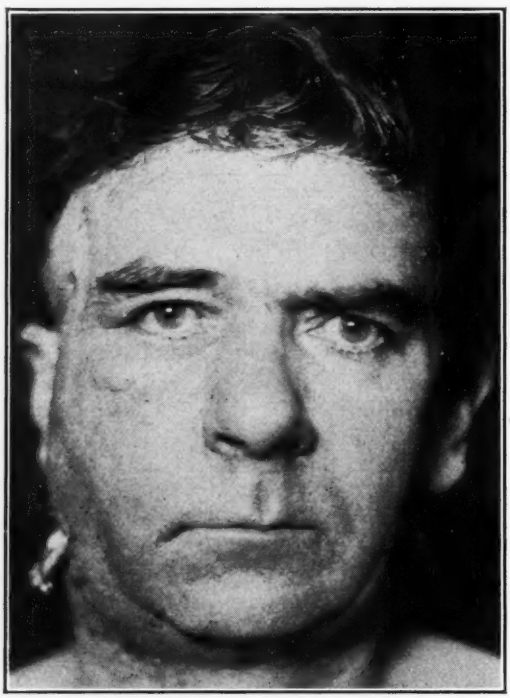

Fig. 3.—Front view showing almost complete subsidence of swelling. Function of the seventh nerve has returned, but there is an opening of the jaw of only a few millimeters.

There was rapid drop of temperature, however, it being normal the second day and remaining so. (Charts 2 and 3.)

On the first day after operation no sugar was found in the urine and the blood sugar was 137. The patient was no longer considered a true diabetic and

was not even put on a diet. This is an excellent example of the ramifications of infection in the general functions of the body, and is proof of the necessity for thorough examination and diagnosis of these severe dental infections.

Subsequent Course.—With adequate drainage of the soft tissues maintained, there has been no further discomfort except from the discharge and because of the limitation of opening. With the infection and subsequent extensive fibrosis of the closing muscles in this case, it is certain that opening will be limited for a long time. (Fig. 3.)

The bone involvement of the mandible is shown on x-ray to center about the angle; in the maxilla it is about the lower border of the zygoma. As is our policy in all cases of osteomyelitis, soft tissue drainage will be maintained, and spontaneous separation of the dead bone awaited. Then the separated fragments will be removed with the least possible damage to the granulations in the bone and to the periosteum.[1, 2, 3]

Comment.—(1) This patient gave a history of poor hygienic conditions, and the extremely bad reaction probably occurs more often in such patients than in healthy ones.

(2) The tooth was evidently beginning an acute infection when it was extracted. This is a stage when the organisms have the upper hand and may be assumed to be spreading through the tissues. It is unfortunate that many patients seek relief and demand extractions during this period.

(3) The importance of general physical and laboratory examinations cannot be too fully stressed in these severely infected patients.

(4) The complete dissection of the masseter, internal pterygoid, and temporal muscles, and the involvement of bone by the pus offer a clear-cut picture of the pathologic condition. The failure of recovery until the last foci had been drained is a good guide to the surgical indications.

(5) The drop to normal of the blood sugar and the disappearance of sugar from the urine with the final evacuation of pus are excellent expressions of the necessity for the examination and treatment of the patient as a whole.

(6) The limitation of opening in this case with all the muscles involved should be as prolonged and as severe as in any case. Perhaps six months might be required to obtain even function, and complete opening might never occur. We have not seen real soft tissue ankylosis result, but in this case there was an added slough of the buccal mucosa, and this might increase the contracture.[4]

Case 2. *Extremely Severe Soft Tissue Infection Following an Extraction Which Was Done at the Onset of an Acute Inflammation About a Third Molar. X-Ray Therapy. Surgical Drainage.* A woman of twenty-seven years had been seen in this clinic on three occasions with an acute infection about a partly erupted third molar. She was treated each time and advised to have the tooth extracted during a period when there was no surrounding infection.

At the onset of another painful infection when little local sign was present, she went to the exodontist and had the tooth extracted.

There was severe pain even before she left the office, and pain, swelling and fever increased rapidly to an alarming degree.

She was first seen on this service about the fifth day when she was brought to the hospital.

Examination.—Patient was extremely debilitated and in excessive pain. Temperature 105° (40.6° C.); W.B.C. 17,000.

The face was markedly swollen, with the center of redness and pain and an attempt at softening in front of the lobe of the ear. (The Wassermann test was negative.)

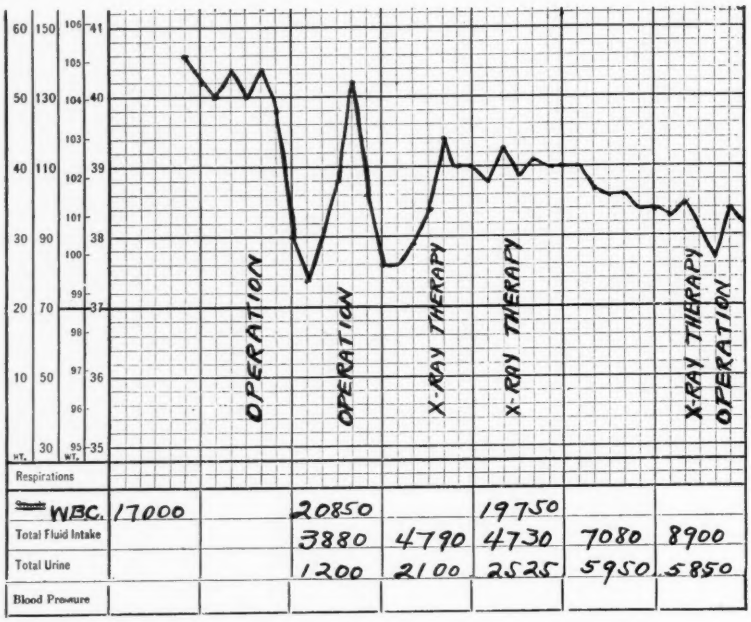

Chart 4.

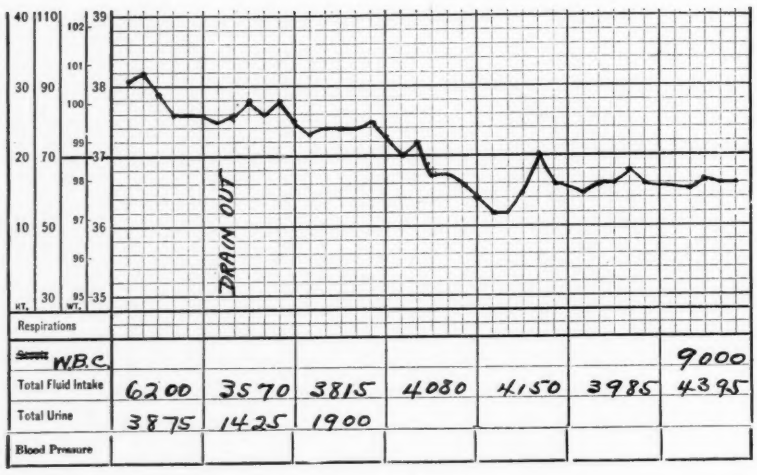

Chart 5.

Charts 4 and 5.—(Case 2.) Showing the stages and procedures as outlined for Case 2.

Course and Treatment.

First Operation.—In the first twenty-four hours fair drainage was established inside the mouth alongside of the socket (chloroform analgesia). There was a hopeful drop in temperature (see Chart 4), but it was short-lived, and the breakdown in the cheek became more evident.

Second Operation.—On the third day under chloroform analgesia, a wide incision was made under the jaw and an attempt made to drain the cheek from this point to prevent making an incision across the cheek that would leave a prominent scar. No pus was obtained, but there was a drop in temperature for a short time.

X-ray therapy was given by Dr. Sherwood Moore on the fourth, fifth, and seventh days. The patient continued to have severe pain; there was almost complete loss of opening of the mouth; and, on the seventh day, after the third x-ray treatment, there was definite fluctuation in the cheek.

Third Operation.—(Chloroform analgesia.) One more chance was taken with the dependent and hidden location of the drainage point, and the old incision was reopened with forceps that extended clear up into the cheek and encountered a large cavity. Foul smelling pus was evacuated and the cavity lightly packed with iodoform gauze. Culture of this pus gave no growth.

Result of Treatment.—There was immediate drop of temperature; it was normal on the fourth day (see Chart 5). The iodoform pack was removed after forty-eight hours and left out. There was rapid local improvement with no loss of bone, and complete healing in fourteen days. Normal opening of the mouth did not return for four months, and it was only at about this time that the patient's return to health could be considered complete.

Comment.—(1) This patient chose exactly the wrong time to have the extraction done; that is, at the outset of an acute soft tissue infection about the area. In these cases of inflammation about erupting third molars the acute stage of infection should be treated conservatively and the extraction delayed. This has been fully outlined previously.[4]

(2) The infection here was a wide one of the soft tissues, mainly in the region of the masseter, and the opening of the mouth was slow in returning to normal. The bone itself was apparently not involved.

(3) The location of the drainage point is thought to be of value. Although a chance was taken in locating it away from the area of softening, when drainage once was established the opening was the most dependent. There is a real advantage in having the scar under the jaw rather than across the cheek.

(4) The fluid intake, as listed at the bottom of Charts 4 and 5, in cubic centimeters per twenty-four hours, is an important point in the general care of these patients. Because of the dysphagia that is present it may appear difficult to get sufficient fluid into them. One excellent way is to have some one in close attendance, at frequent intervals place several cubic centimeters of fluid with a syringe in the buccal fornix. As the patient swallows naturally, this will be taken, and it may even be done in the sleep. Where dysphagia is practically complete, a small soft nasal tube or rubber catheter (Nos. 14 to 16) is passed through the nostril into the stomach. In severe cases, rectal taps, subcutaneous saline, and intravenous glucose are given. Many of these patients are admitted depleted of fluid and food. A simple guide to the condition is an acetone test of the urine for acidosis. If the test is positive, one of the first indications of treatment is the relief of this condition.

(5) The white blood count in this patient shows an excellent reaction, ranging as high as 20,850 on the third day (see Charts 4 and 5).

(6) Chloroform was used three times for this patient, and also for the other three patients in this series. If given slowly and with a large supply of air, there is little danger in its administration. It is perhaps the easiest anesthetic to take. Complete anesthesia is not necessary; with the early analgesia obtained, incisions and explorations and packings may be done and the patient awake almost as quickly as after nitrous oxide or ethylene. The cough reflex is not lost, and there is not much danger of aspiration, even if the work is done inside the mouth. The cumbersome apparatus of the gas machine is not in the way, and the deep anesthesia of ether is not necessary.

Delayed chloroform poisoning would practically never occur from the usual short anesthetic, but, as a safeguard, the patient may be given sodium bicarbonate and excess carbohydrates (if he is not a diabetic).

For small children practically the same effect can be obtained with ether.

(7) The return to normal general health may be a slow process. There is great general and nervous debilitation from one of these severe infections, and enforced rest, adequate diet, and sedation are to be carried out until it is seen that the patient approaches normal.

Case 3. *Extreme Cellulitis Following Extraction Under Block Anesthesia. X-Ray Therapy With Rapid Breakdown of Tissue. Surgical Drainage.* A woman of thirty-one years required three attempts at nerve blocking before successful anesthesia was obtained. The tooth was extracted without trouble, but there were almost immediate pain, swelling and trismus. This condition increased for eight days under local treatment of heat and irrigations, when she was sent to this service at the hospital.

Examination.—She was haggard-looking and suffering intense pain; any attempt at opening the mouth greatly aggravated the pain. The face and neck were swollen and hard with no sign of pus. The inside of the mouth was dirty. (The Wassermann test was negative.)

Course and Treatment.—She was put at rest in bed, given continual external heat and sedatives. The pain, swelling and hardness progressed with no sign of softening.

X-ray therapy was given by Dr. Sherwood Moore on the fourth day, and in thirty-six hours there was almost complete breakdown of the tissues with the formation of pus.

Operation.—(Chloroform analgesia). Wide drainage was established below the jaw and a large amount of pus evacuated that did not have a markedly offensive odor. A huge cavity with much necrotic tissue was found that extended clear to the base of the skull—perhaps to the pterygoid fossa. The angle and the ramus of the jaw were entirely devoid of periosteal covering. The cavity was lightly packed with iodoform gauze.

The temperature dropped to normal the next day, and the patient was comfortable. There was another rise for twenty-four hours, but, when the pack was removed, there was a rapid return to normal and continued freedom from pain. (See Charts 6 and 7.)

Comment.—(1) This spreading cellulitis throughout the regions of the masseter and internal pterygoid muscles was extremely painful and tense, and slow to make pus.

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(2) X-ray therapy given this patient (as in Case 2) gave a brilliant demonstration of its power to hasten the process of pus formation. In some instances of cellulitis without pus formation, it causes a resolution of the process without breakdown of the tissues.

In these two cases it was thought to have been of great benefit.

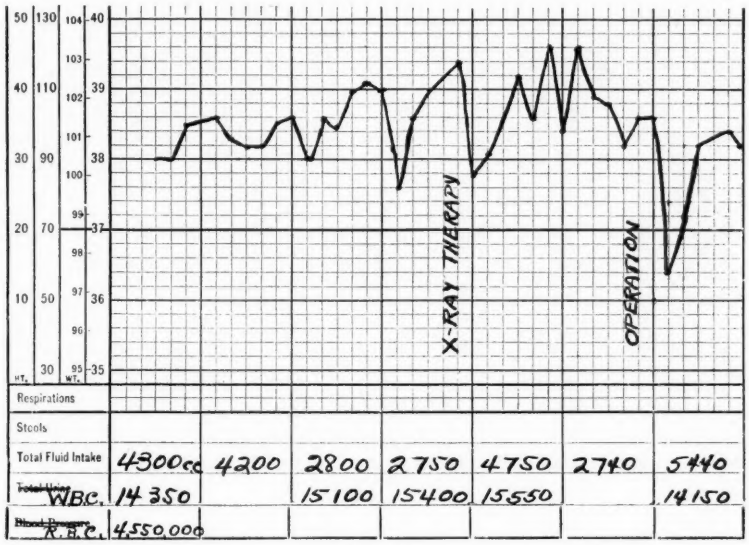

Chart 6.

Chart 7.

Charts 6 and 7.—(Case 3.) The first three days show a moderate temperature. Following the x-ray treatment on the fourth day there is a sharp drop, presumably due to a control of the infection. There is then a rise due to the retention of pus that has just been formed. Following the operation there is a return to normal, and then another slight rise, probably from dammed up secretions. With the release of this (Chart 7) there is a continued normal temperature.

The white blood counts show a good reaction. The fluid intake is adequate on most of the days.

X-ray therapy is used in a great many similar infections and in general throughout the body for boils, carbuncles, acute cervical adenitis, tuberculosis of the cervical glands, erysipelas, etc.

(3) The stripping up or loss of the periosteum is not a certain sign that any bone will be lost, and it is thought that there will be no sequestration in this patient.

(4) The culture of the pus showed nothing but *B. diphtheroids.*

CASE 4. *Neglected Caries. Abscess Formation About Internal Pterygoid After Perforation of the Lingual Plate.* A girl of fifteen years who had totally neglected her teeth, never having been in a dentist's chair, developed an infection in the jaw through a carious molar. An attempt had been made to drain the infection through the tooth.

Examination.—She was seen on the tenth day with a large fluctuant swelling about the jaw and neck, extreme pain and almost complete trismus. The mouth was foul with many carious teeth. (The Wassermann test was negative.)

Treatment.—The involved tooth was not extracted at this time.

Operation.—Under chloroform analgesia a wide incision was made under the jaw and carried up along the buccal surface by blunt dissection. No pus

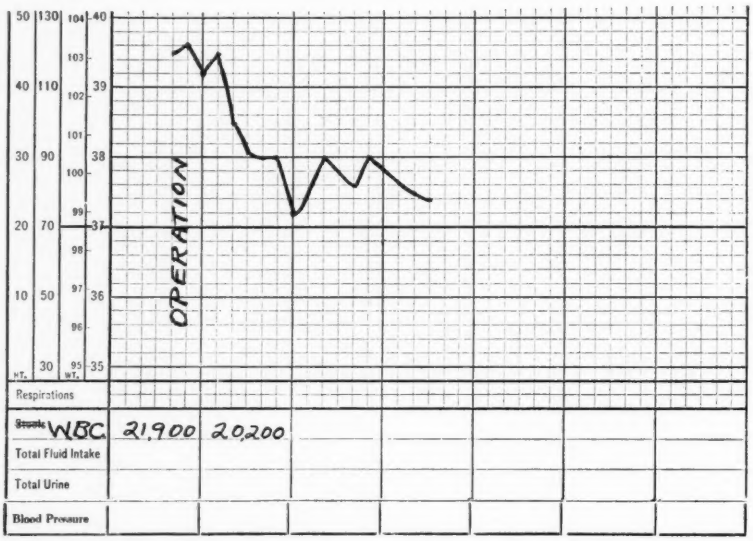

Chart 8.—(Case 4.) Shows a fairly typical temperature reaction in a young person, otherwise healthy, undergoing a severe infection. The white blood count of 21,900 is an excellent defense mechanism.

was found here, but on entering the tissues on the labial side, a large amount of foul pus was evacuated. The whole lower border of the jaw was bare in this region, and the cavity extended up into the tongue. The wound was lightly packed with iodoform gauze. Culture of the pus gave no growth.

Course.—Chart 8 shows the rapid return to normal of the temperature. The wound closed without sequestration of the bone, and the tooth was removed about two and one-half weeks later when healing had occurred and the opening was about normal.

Comment.—(1) Neglect of teeth with caries is a frequent cause of severe dental infections and osteomyelitis. Teeth that decay away to shells form cesspools in the mandible with direct connection to the center of the bone through the open root canals.

(2) After the infection has "eaten" clear through one plate of the jaw bone and involved the soft tissues, it is useless to try to get drainage through the tooth as was done in this case.

(3) Most of the jaw infections we see on this service break through and

involve the buccal side first; in this patient the involvement was entirely on the lingual side.

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CONGENITAL ATRESIA OR OBSTRUCTION OF THE NASAL AIR PASSAGES*†

V. P. Blair, M.D., St. Louis, Mo.

IN THE congenital deformities encountered at or near the junction of the frontal and maxillary tubercles, we have run across a number of details, the morphology of which is not entirely explained by our own limited and standardized conception of the embryology of this region.

For the sake of simplifying the presentation, the cited cases are roughly divided into those with (1) atresia at the anterior nares, (2) atresia at the posterior nares, (3) obstruction by some malformation within the passages, (4) total absence of nasal passages, and (5) pharyngeal narrowing due to backward displacement of the maxilla. We have observed but one case of complete absence of nasal fossae and nose. We have encountered an obstructing hydrocele within the nose, and it is not improbable that the obstructing nasopharyngeal polyp of early childhood is also congenital in its origin.

All the cases of atresia at the anterior nares seemed to be lacking the ala on that side, though in some the nostril was indicated by a dimple alongside the columella (Figs. 1 and 5). In Figs. 2, 3 and 6 there was no trace of this. In most of these there is a scar or a slight bony tubercle just above the inner canthus, and in all there is a downward turn to the inner canthus on the affected side. Fig. 6 may be an explanation of these cases. The tube hanging from above the inner canthus rather suggested by its contour and make-up that it might represent all of the structures of the missing half of the external nose except the bone, while the lack of patency at the lower end of the lacrimal sac suggests that possibly it also represented the nasal duct. Fig. 1 showed no supracanthal mark of a possible one-time attachment of a similar nasal tube, nor any symptoms suggesting obstruction of the duct. In all of these unilateral anterior nasal obstructions there was a nasal cavity on that side, though in one (Fig. 6) it seemed to be blind or obstructed posteriorly. Cases of this sort were dealt with differently according to age and individual variations as illustrated under Figs. 1, 2, 3, 5, and 6.

Most of the cases of atresia at the posterior nares that we have seen were unilateral, and associated with some patency of the facial clefts. In all, the nasal mucosa ended in a blind pouch posteriorly, and there was an anterior wall of mucosa and submucosa to the nasopharynx. The normal approach for correction of the obstruction here would seem to be by splitting the mucoperiosteum of the palate and velum, as shown under Fig. 7. Where it has accompanied unilateral cleft of the palate, the obstruction was on the side opposite the cleft and could be dealt with at the time of the repair of the palate. We once overlooked one of these and think it a good rule to verify the

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patency of the posterior naris on the uncleft side by passing a small soft catheter.

Obstructions occurring within the nasal passages have been widely divergent in character, and in most of them there has been a slight or wide bifurcation, or a partial reduplication of the nose (Figs. 8, 9, and 10), but the

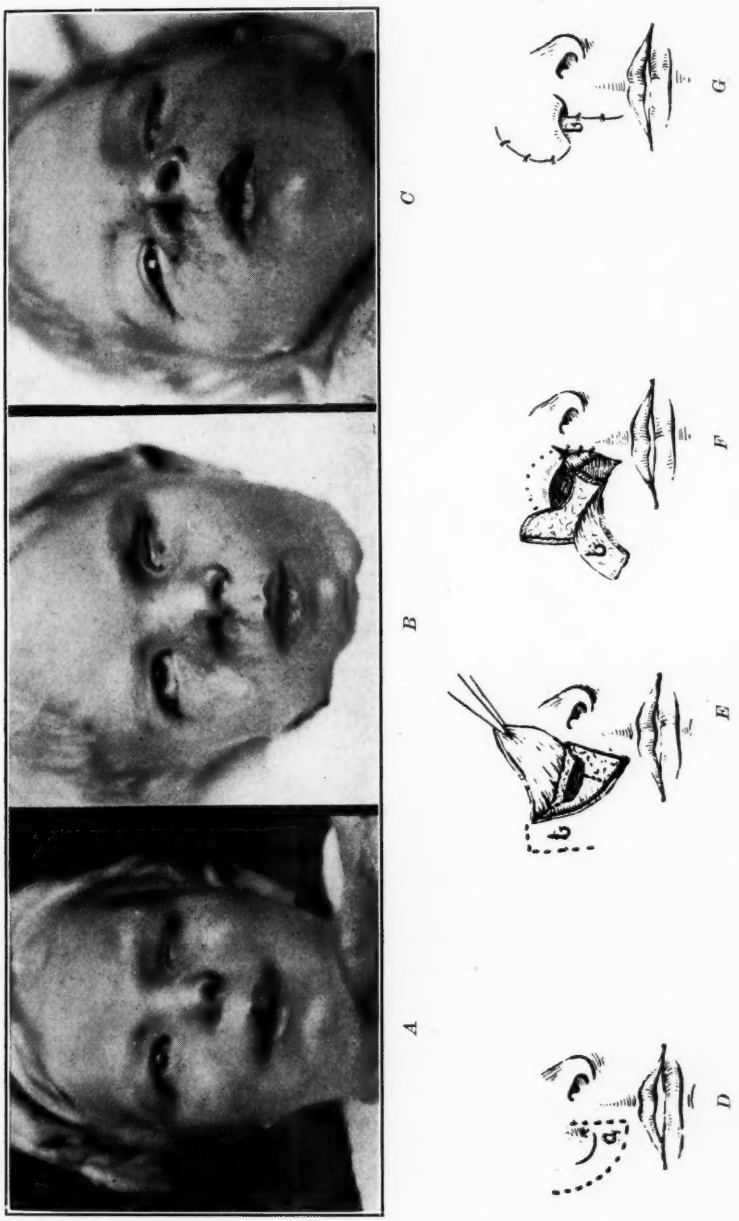
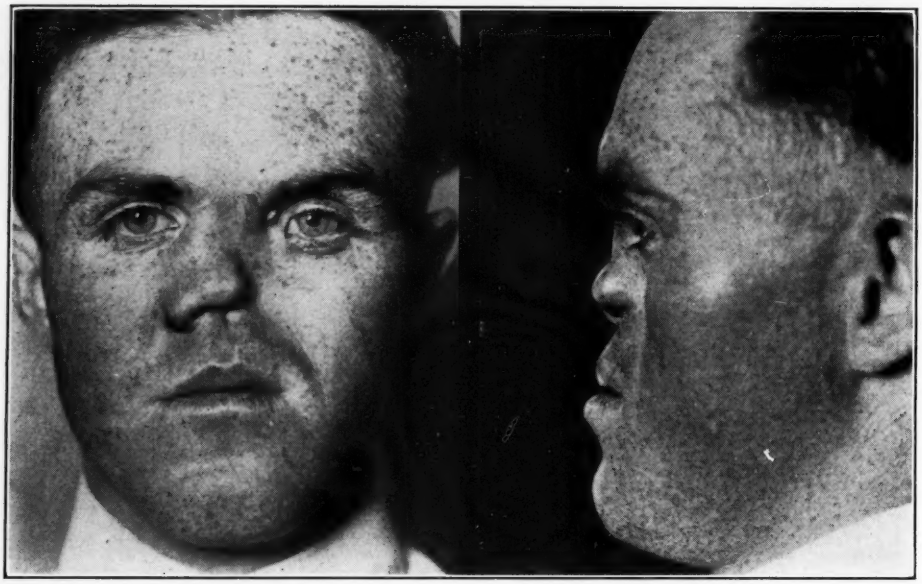


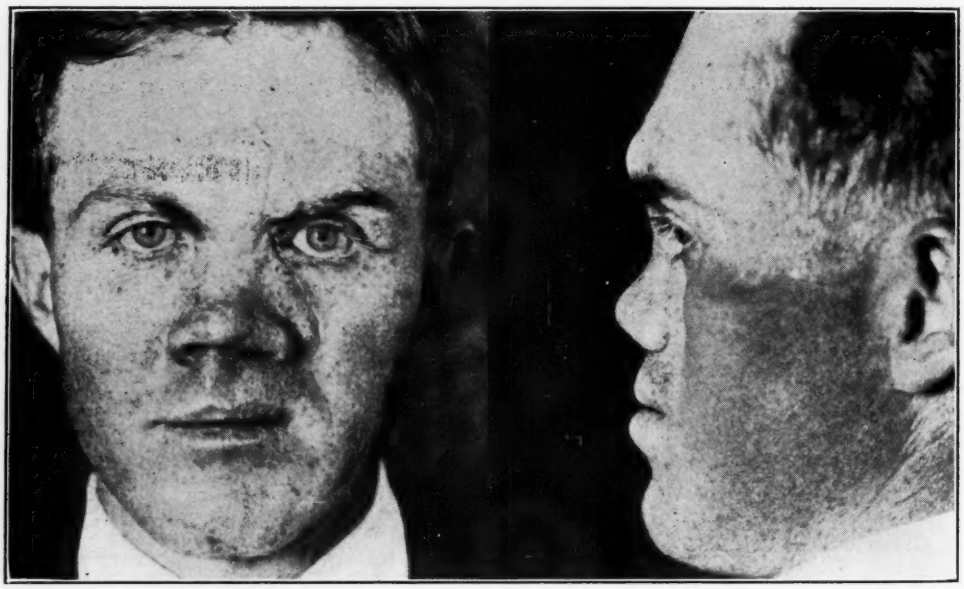
Fig. 1.—(Case 1.) *A* shows child apparently minus an outer nares but with a dimple to suggest the position of the nostril. While it lacked an ala and vestibule on that side, above this the nose appeared to be of normal fullness. This latter was true of none of the other three cases here shown. There was no evidence of lacrimal duct obstruction, and at the operation there was found a well-developed nasal fossa behind a thin layer of bone lined by mucosa and covered with face tissue. *B* and *C* show the correction obtained by operation that also gave him an apparently free breathing space on that side. *D*, *E*, *F* and *G* show the plan of operation that was completed at one step. The opposite eye is seen to be congenitally deformed.

majority of bifid noses which we have seen were not obstructed more than comes from misshapen septa or turbinates. In Fig. 8, the obstruction may have been due primarily to an overdevelopment of the maxillary sinuses which crowded the nasal floor upward and the lateral walls inward, or the abnormal size of these sinuses may have been secondary to some condition within the



A *B*

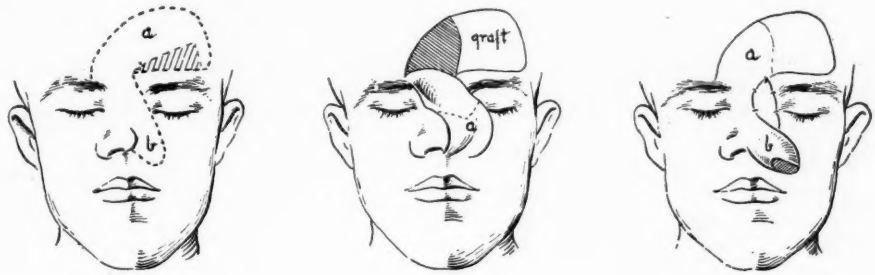
Fig. 2.—(Case 2.) *A* and *B* are front and side views, preoperative, of a man twenty-four years of age with congenital absence of the left half of the nose and atresia at the anterior naris with collapsed left nasal fossa behind this, and also blockage of the nasal duct. Note the shortness of the nose, retraction of base, downward inclination of internal canthus with bony tubercle above it.



A *B*

Fig. 3.—(Case 2.) *A* and *B*. Taken seventeen months later show the final result after the obstructed left lacrimal sac had been removed and the internal canthus put in a more normal position.

nose itself. In Fig. 9, the obstruction was due to incomplete descent of the premaxilla and prolabium, cause or effect of the bifurcation—who knows? In Fig. 10, the nasal passages were impinged upon by what seemed to consist chiefly of a widened mass of reduplicated vertical plate of the vomer and quadrilateral cartilage. This might be the result of dichotomy as expounded by Bland-Sutton, or the rather complete reduplication of the nose on one side might be more in the line of abortive twin formation. In Figs. 11, 12, and 13, there was a total absence of any essential nasal structure or of any structure derived from the nose or its lining.

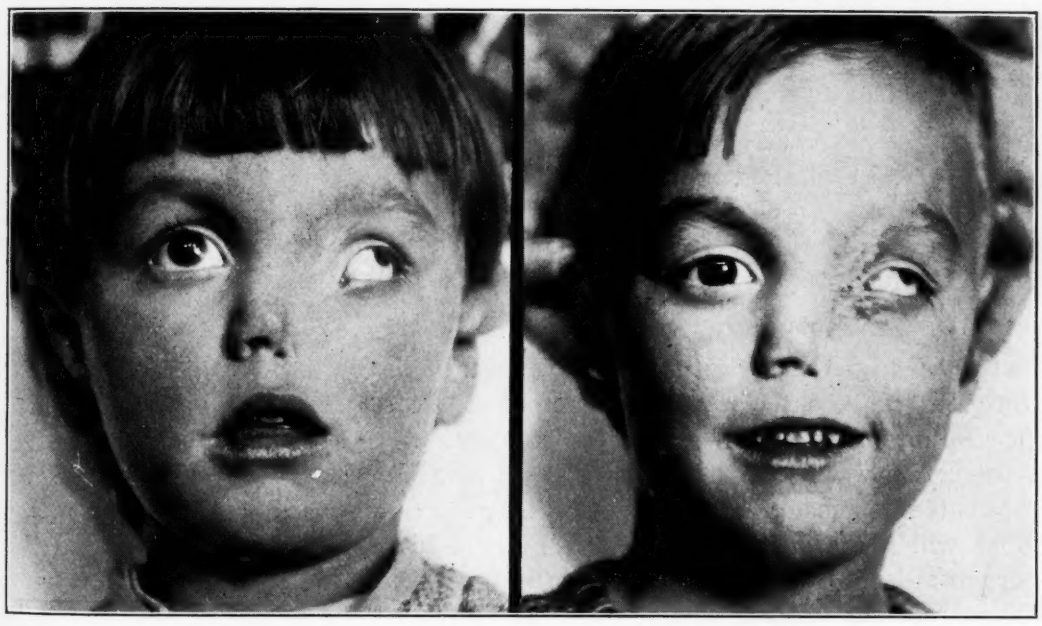


A *B* *C*

Fig. 4.—(Case 2.) *A*, Flaps outlined on forehead and cheek. Flap *a* was raised from the forehead, and *b* from the cheek, both being sutured back in their beds and allowed to season for six weeks.

B. Flap *b* has been raised again from the cheek to form the external surface of the new left side, while the *a* flap has been brought down to line the left side and to repair the defect in the cheek. As shown here it hides flap *b*.

C. The pedicle of flap *a* has been cut and returned to the forehead while the outer border of the reconstructed side of the nose and ala remains free. The free border was later freshened and implanted into its proper place on the cheek, which you will observe was onto the surface of the transplanted part of flap *a*. Before doing this, an attempt was made to establish the patency of the anterior naris of that side.



A *B*

Fig. 5.—(Case 3.) *A* shows child five years old of rather the same type as case shown in Figs. 2 and 3. Operation on the nose will be postponed until he attains his approximate growth. However, owing to the suppuration in the blocked lacrimal sac the latter was removed and the deformity of the internal canthus was more or less successfully corrected by a flap switching operation. *B* shows the child after operation.

In complete congenital cleft of the lip and alveolar process there may be very marked obstruction of the breathing passages; in a single cleft it is partially due to the tip of the nose and columella and lower border of the quadrilateral cartilage shifting away from the cleft and the body of the septum bending with its convexity toward the cleft side. This is not apparent in early infancy but develops within a few years in any older child that has had a poor adjustment or none at all of the ala and floor of the nostril. When the columella and ala are brought into their proper relation, the obstruction may become greater and remains so until corrected by operation. In complete double cleft of the lip and alveolar process, the septum and premaxilla remain in midline, but the

A *B*

Fig. 6.—(Case 4.) *A* shows an odd case which possibly throws some light on the morphology of the preceding or at least Figs. 2, 3 and 5. On the right side the child has half a nose. On the left attached above and to the internal canthus is a hollow, mucous lined cylinder of flesh, the conformity of the lower end of which reminded one of the ala and was circular in form. A thin purulent fluid leaked from its open end which we thought to be tears. In the correction an attempt was made to open this tube longitudinally and use it to make the right side of the nose, including ala and vestibule. This did not work out completely but part of it was used to make the right side of the nose with the idea of doing further work on the child when it approached maturity. During the course of this work it was necessary to open the face and establish drainage into the pharynx of a blind mucous lined cavity which probably represented the nasal fossa.

latter is displaced forward and the mass of the septum is abnormally wide just behind its attachment. When such a cleft is repaired without making special provision to establish a nasal breathing space, there may result an obstruction which will require relief. In both the single and double complete clefts there is usually enough essential tissue to reconstruct a floor of the nostril that will give breathing space, but quite a bit of this is usually displaced downward onto what appears to be the lip, and, in the repair, unless this is identified and restored to its proper habitat, greater obstruction may result. Some impingement may occur, even with the most careful conservation. Also, in either the double or single cleft a tooth may erupt or remain imbedded within or about the floor that may cause some obstruction.

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We have seen a few babies who had a combination of, possibly, some backward displacement of the face on the base of the skull, marked retraction of the chin, and an anteroposterior flattening of the pharynx, accompanied by a cleft of the velum. This latter is a fortunate accident or essential, whichever may be. In one of these we repaired the palate at the end of the first year,

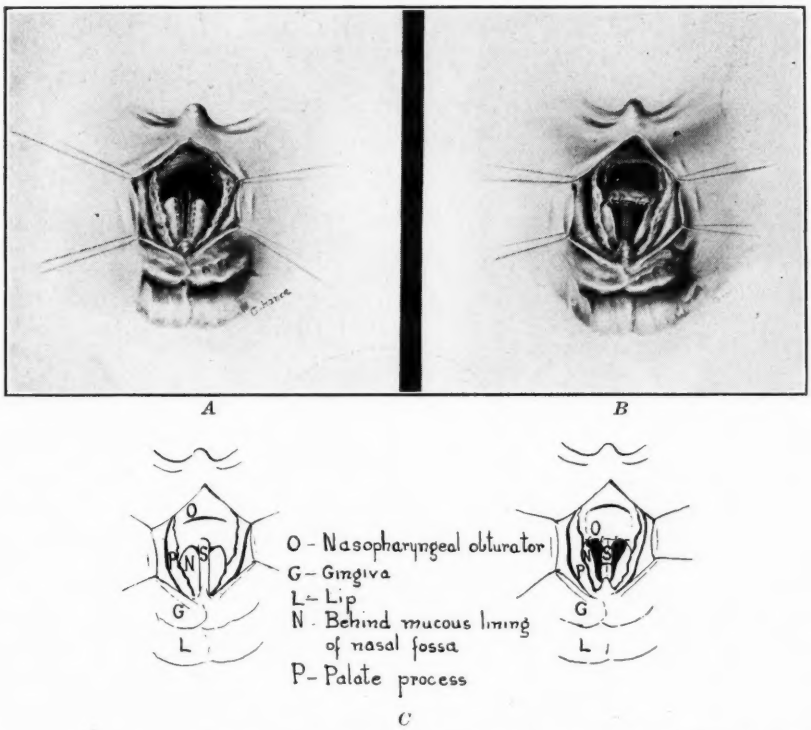


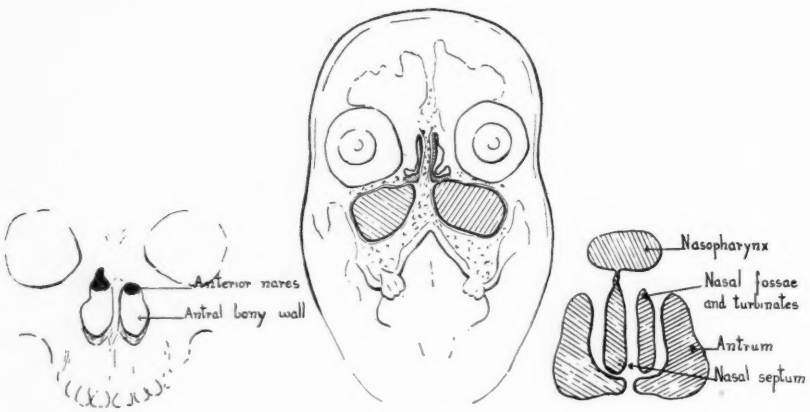
Fig. 7.—(Case 5.) *A* is a drawing made from a sketch done at an operation for the relief of congenital bilateral obstruction of the nose at the posterior nares. This stage was attained by first dividing, then raising up the mucoperiosteum from the underlying palate processes, and retracting each half with silk sutures weighted with artery forceps. The major part of the palate process has been removed as well as that of the cartilage and bone of the nasal septum. A mass of fibrous connective tissue which lay between the blind posterior ends of the nasal fossae and the nasopharyngeal obturator has also been removed. The obturator consisted of mucous membrane covering the posterior surface of a fibrous curtain.

B. The two mucous pouches of the nasal fossae were incised along the dotted line shown in *A*, and the two median free edges were sutured together below the stump of the nasal septum. The nasopharyngeal obturator was converted into a tongue-shaped flap by an incision indicated by dotted line in *A*. This flap was sutured anteriorly and laterally to the mucosa of the nasal fossae, thus completing a continuous passage into the nasopharynx, mucous lined on its upper and lateral surfaces. The operation was completed by suturing the mucoperiosteum in the midline.

and then had to put a rubber tube through the mouth into the pharynx to let the child breathe comfortably. The tube, or something else, caused the sutured halves of the velum to separate and then all was well again. This anatomic condition seems to correct itself with growth. In one baby that required tube feeding for the first nine months, the relations gradually improved until at two years it had a rather normal appearance, and closure of the palate at this time gave it no inconvenience. It has been our observation that a young baby is restless, loses sleep and weight, and does bad generally if it has not free nasal breathing.

Plans of correction are outlined in the legends of the accompanying illustrations.

A B



C D E

Fig. 8.—(Case 6.) *A* shows photograph of an eight-year-old girl with a bifid nose and characteristic breadth between the eyes which has been described as a hypertelorism. She had no breathing space in the nose. The vestibules were closed posteriorly by a mucus-covered bony wall with pinhole communication with the deeper fossae high up. Correction consisted in raising the upper lip and associated face tissues through an incision in the upper fornix, down to the bone and raising the periosteum, along with the other tissues. In removing the thin underlying bony wall, it was found that there were two immense maxillary sinuses which approximated each other in the midline in front, and also below the floor of the nose. See *C* and *D*. The essential intranasal structures were crowded together into a small space which is shown in *B* as the dark mass in the center of the nasal region.

B. Anteroposterior x-ray which, until it could be interpreted in the light of the operative findings, threw little light on the case except that the paranasal sinuses were present.

C. Semidiagrammatic representation of the findings on raising the lip and cheeks from the maxillary bones. The anterior nares are shown obstructed by the anterior wall of the antrum with a small communication above on each side that led into the nasal fossae.

D is an imaginary transverse section through the skull based on the operative findings. It shows the turbinate bones and septum proper crowded up between the orbits, and the space for the lower portion of the nasal fossae obliterated by the antra meeting in the midplane but separated by a bony septum. The palate was V-shaped.

E is an imaginary coronal section made just below the anterior openings of the nasal fossae (see *C*) showing the relation of the maxillary antra to the nasal fossae and showing also that the left nasal fossa had no demonstrable communication with the nasopharynx. Posteriorly, it was thought that there was a very small communication between the right nasal fossa and nasopharynx.

With biting forceps the whole of the obstructing mass, including the anterior wall of the maxillary sinus within the anterior nares, the median walls of the two antra which were the outer walls of the nasal fossae in the lower part, the floor of the nasal fossae and the median septum down to the palate process, and the nasopharyngeal obturator were removed, converting the whole into one large, mostly mucus-lined cavity opening anteriorly into the nostrils and posteriorly into the pharynx. It had been intended to cover the raw bony surfaces with split skin grafts, but on account of the condition of the child, these surfaces were dressed with light iodoform gauze packs, and the remaining part of the repair was postponed. The child made a good postoperative recovery.

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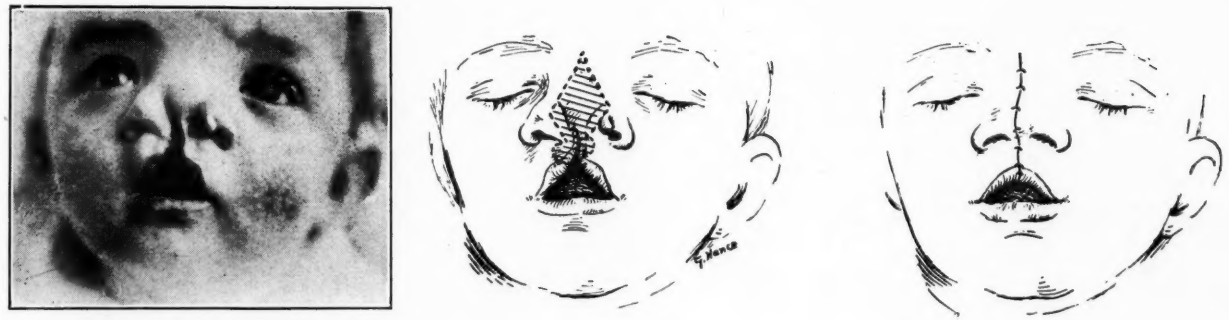


A *B* *C*

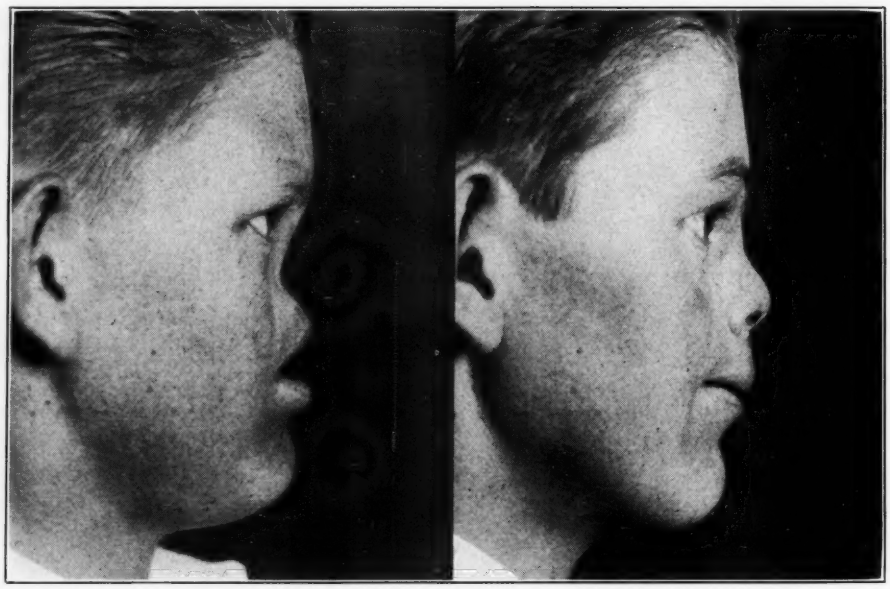
Fig. 9.—(Case 7.) *A* shows a child with a bifid nose and a median cleft of the upper lip, the nasal passages being rather completely obstructed by a mass lying behind the rounded prominence that can be seen between the two halves of the nose. At operation this was found to be a partially descended premaxillary mass containing two central incisors.

B, Drawing showing the incision that was made through the full thickness of the lips, the wall of the nose above, and skirting the median surfaces of the two halves of the nasal septum and columella through which a pyramidal mass of skin, bone, cartilage and mucosa, with its apex at the nasopharynx was removed. The soft tissues of the face were undermined until they could be approximated in the midline. The papillum on the left side was removed.

C is a drawing made from postmortem photograph, the child having failed to survive the operation more than a few hours.

A *B*

Fig. 10.—(Case 8.) A patient with a partial reduplication of the nose who was sent to us at the age of four months, after the cleft of the lip had been repaired. It was treated along the general plan described under Fig. 9, but with the aid of hypodermoclysis during operation and blood transfusion afterward, the child went along without any evidence of shock. *B* shows a picture of the child three years later; probably has a very flat bridge which will be benefited by a cartilage transplant later.



A *B*

Fig. 11.—(Case 9.) *A* shows a side view of boy who was born with no evidence of any nasal structure. *B* shows the external correction which was done by means of a flap from the forehead after excising the lacrimal sacs, letting down the upper lip, establishing a skin-lined breathing tube by chiseling through a mass of bone that lay just above the palate and establishing connection with the nasopharynx.

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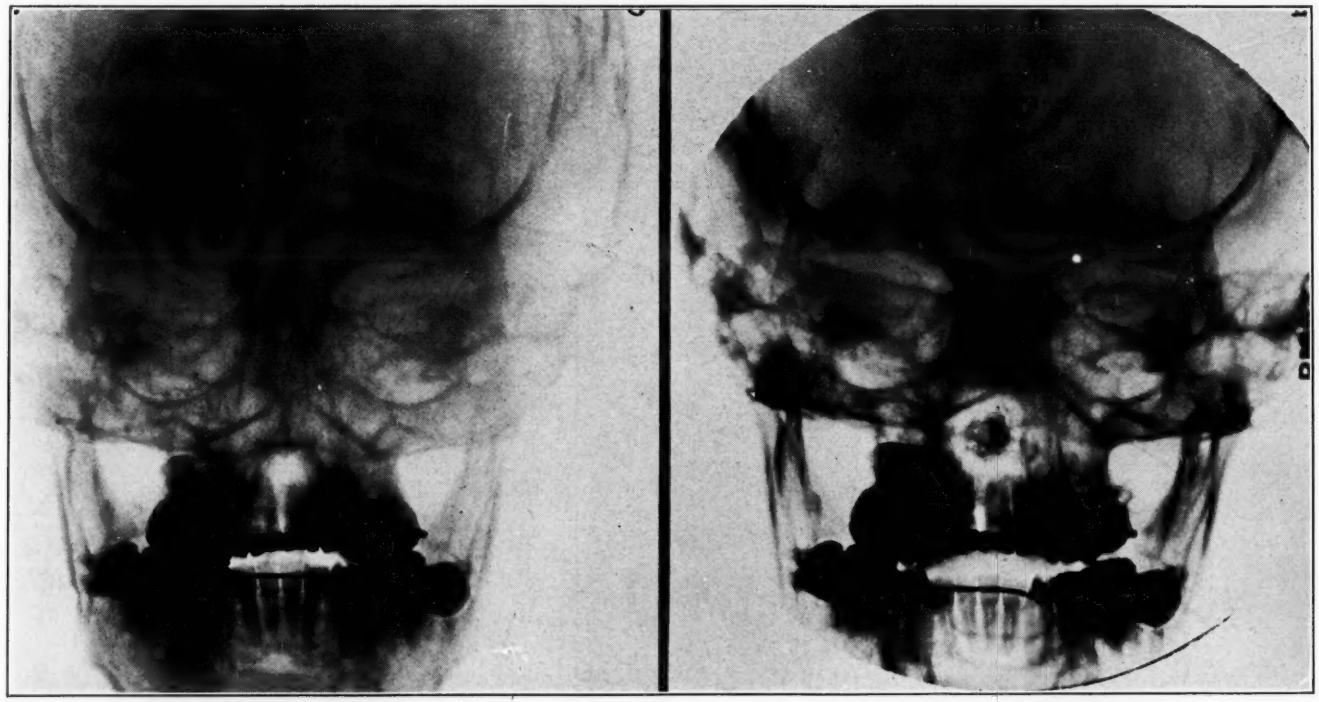
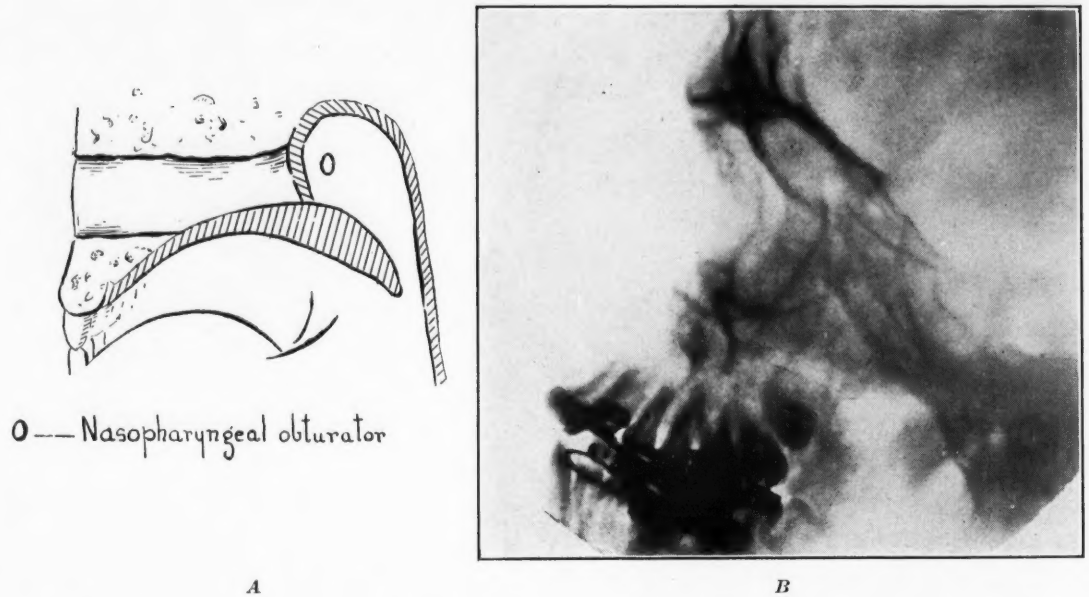


A *B*

Fig. 12.—(Case 9.) *A* is an anteroposterior x-ray taken before the operation which shows the complete absence of nasal sinuses or a nasal passage.

B shows the same case after chiseling in a nasal passage. The dark spot in the new nasal passage is iodoform gauze. *A* and *B* are of different weights, the better to study the region of the sinuses.



A *B*

Fig. 13.—(Case 9.) *A* is a diagrammatic drawing showing the new nasal passage which was chiseled through a solid bony mass back to the mucus-covered nasopharyngeal obturator. This tube was epitheliated by enveloping a mass of rolled gauze in a large split skin graft, raw surface out, and drawing this into the new bony tunnel through the nasopharynx and through a cross incision in the nasopharyngeal obturator. This backward way of introducing the pack that carried the graft drew the triangular flaps of the nasopharyngeal obturator into the bony tube, raw surface of flap to raw surface of bone where they could heal with little chance of the obturator becoming reestablished. The contamination of the graft with saliva was entirely disregarded because with a patient who shows no signs of active infection at the time of operation, and who does not develop some infectious disease afterward, we except practically 100 per cent healing in of the grafts if the raw surfaces are cleanly cut and proper pressure is maintained.

In *B* the new bony canal is quite discernible.

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POSTOPERATIVE PAIN AS A PROBLEM OF CLINICAL DENTISTRY*

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PAIN that follows oral surgical procedures, from the simplest type of tooth removal to the major oral surgical operation, may no longer be considered a matter of accidental occurrence. We are confronted with this phenomenon so often, and under so many varying conditions, that we may view it in the light of a serious problem of clinical dentistry. I dealt with after-pain as a problem of technic of postoperative treatment in my recent work on exodontia.[1] There I pointed out that so far no standardized procedures for after-pain have been adopted. I also discussed, in a different chapter, accidents and infections following local anesthesia, independently of the question of after-pain. I now propose to treat the question of after-pain as a distinct phase of postoperative complications following surgical therapy in dental practice.

I know of no systematized intensive effort that is being made to deal with this problem. This may be due to the fact that its seriousness has not been recognized. We are, however, attempting to formulate an approach to the study of this problem from the standpoint of bacteriologic and clinical research along the lines here indicated. While postoperative and operative technic have received their share of attention, I believe that the time has actually arrived for a more scientific handling of the problem of postoperative complications where we consider after-pain as one of its more striking clinical manifestations.

In offering this suggestion, I am reminded of Thomas Addison, the first to bring to light the association of constitutional symptoms with disease of the suprarenal glands, who accidentally "stumbled" on this idea while trying to solve the etiology of what is now known as pernicious anemia and occasionally called Addison's disease. The name Addison's disease, which disease is usually the result of tuberculosis of the suprarenal glands, was later given to this symptom complex by Armand Trousseau, a French physician, when the importance of the endocrine glands in physiology was better understood. The following paragraph from Addison's report (1855) is illuminating of how the problems of pathology have been dealt with as recorded in history.[2]

"It was whilst seeking in vain to throw some additional light upon this form of anemia that I stumbled upon the curious facts which it is my more immediate object to make known to the profession; and however unsatisfactory or unimportant they may at first sight appear, I cannot but indulge the hope that by attracting the attention and enlisting the cooperation of the profession at large, they may lead to the subject being properly examined and sifted, and the inquiry so extended as to suggest, at least, some interesting physiologic speculation, if not still more important practical indications."

It is not unlikely that we too may "stumble" on more practical discoveries while attempting to solve the problem before us.

*Read before the First District Dental Society, Oral Surgery Section.

SHOULD POSTOPERATIVE PAIN BE ANTICIPATED IN EXODONTIC OPERATIONS?

In discussing the particular phase of this subject of postoperative pain, I direct my remarks to the general practitioner. It is he who may find this presentation of practical usefulness and for whose helpfulness this is intended. Pursuing this thought, I am going to deal particularly with postoperative pain following exodontic procedures, rather than that of the more advanced cases of oral surgery. There are those members of our profession who repeatedly state that they are able to carry out various types of surgical operations without the patient's suffering after-pain. However, it is my opinion that these gentlemen, perhaps, confine their operations to the maxilla, else I question the veracity of their statement.

I can conceive of nothing that is more distressing to the general practitioner of dentistry than to have a patient return complaining of postoperative pain. I have no panacea to offer for the relief of this type of pain, but I wish to offer some suggestions which may mitigate it, prevent it in certain cases, or help by the treatment of it with drugs and physical therapy. This problem of postoperative pain is one which naturally interests us all on account of the element of confidence which is either lessened or increased on the part of our patient. The dissemination of loose verbiage by the profession among the public has caused a great many patients to expect, as a rule, that all exodontic procedures be followed without any postoperative pain. Consequently, tooth removal is probably the only surgical condition where so much is expected. Following all other surgical operations, regardless of the anesthetic that has been employed, one does expect a certain amount of discomfort subsequently.

Regarding the relative degree of pain following the employment of general or local anesthesia, it is my experience that it is about the same in both instances. The pain bears a direct relationship to the amount of trauma instituted. Local anesthesia, as such, is at fault only when the proper technic, in (1) the nature of the armamentarium, or (2) the solution, or (3) the injection, has not been carried out.

CAUSES OF POSTOPERATIVE PAIN FOLLOWING LOCAL ANESTHESIA

Let us first consider the question of the armamentarium. Proper sterilization of the syringes and needles is of the utmost importance, on account of the various antirust substances which are placed in the common sterilizers and which are incompatible with the anesthetic solution. They act usually as tissue irritants. It is well to have a small sterilizer at hand exclusively for this purpose.

Let us next consider the question of the needles. Old needles should not be used, as they cannot be properly cleansed. As a result, some of the oxidized material in the lumen of the needle may enter the tissues, and produce a very severe reaction. This, of course, results in postoperative pain.

We find that the repeated boiling of salt, or Ringer's solution, produces a hypertonic solution. This solution alone, when not used as a vehicle or solvent for the anesthetic solution, when injected into the tissues may and does produce a necrosis. In this instance, we may have postoperative pain. This is interpreted as the result of the attempt of the tissues to neutralize this fluid which has a far greater osmotic tension than the tissue fluid. It is therefore preferable to

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use sterile distilled water as the vehicle whenever there is any doubt as to the isotonicity of the solvent.

The saturation index, in percentages, of the solution with epinephrin is a factor of considerable importance. We find that a solution containing 1:50,000 suprarenin is ample to produce the proper anesthetic effect. At the same time, such a solution will not produce a condition resembling a localized acidosis, which represents a severe constriction of the vessels caused by too high an adrenalin content.

A too rapid injection of the anesthetic solution is often the cause of postoperative pain. If one-half a minute is taken for the injection of 1 c.c. of the anesthetic fluid, there is likely to be little pain. There is a greater opportunity for a more grateful patient. Injections under too great a pressure under the periosteum should be avoided, as they actually rupture the fibers and produce very severe pain.

INJECTION INTO MUSCLE AS A CAUSE OF POSTOPERATIVE PAIN

Another important point to remember is the need of guarding against injection of the solution into the muscles. Take, for instance, the mandibular dental injection. The patient will certify to the peculiar prickling sensation of the lip, but, at the same time, will complain of a slight pain as we are about to operate, necessitating infiltration of the particular area. This sensitiveness is observed directly following the injection and is readily explainable. We are dealing with individuals and not with areas of injection. We should remember individual variation reactions. This was called to our attention by Dr. G. W. Crile in his "Anoci Association Theory of Shock," stating that there is a difference in the reaction of different individuals to the same impulse. In making this type of injection, the patient, being as a rule apprehensive, may not open his mouth sufficiently wide. Furthermore, the needle prick induces him to close his mouth a little more. When the operator wishes to advance the needle into the tissues, he requests that the patient open the mouth wide. In so doing, the tissues are pulled upward and forward, which causes the malposition of the puncture point. The operator can check up on this by examining the puncture point after the injection has been made. The differential diagnosis is made in the following manner: when the buccinator nerve has been anesthetized, the numb feeling will not be confined to the lower lip only, but will extend to the corner of the mouth and toward the median line in both the upper and lower lip. When this patient returns, he may complain of postoperative pain caused by the piercing of the muscle fibers.

Another condition of postoperative pain of a similar character occurs in the attempt to anesthetize the posterior maxillary dental nerve. It is an axiom, well established in dental offices, that when a patient sits down in the chair, his mouth is supposed to be wide open. We know, however, that for this injection, the operator will be able to retract the soft tissues sufficiently to be certain that he will not pierce the mucous membrane of the cheek rather than the mucous membrane of the alveolar process of the jaw, if the mouth is open only halfway. Should the mouth be open to the fullest extent, the needle may be inserted into the corpus adiposum bucci, or sucking pad, and the patient will suffer considerable pain as a consequence.

A similar condition occurs in the attempt to anesthetize the infraorbital nerve. This injection should not be made too close to the bone for the reason that directly covering the bone in this area is the caninus muscle. We find over this muscle the infraorbital plexus of nerves, over which is the quadratus labii superioris muscle. If the injection is made too close to the bone, we penetrate the fibers of the caninus muscle; if the injection is made too close to the outer surface, we penetrate the fibers of the quadratus muscle. In either case the result is postoperative pain. It is my belief that if we heed these particular factors, a certain amount of pain may be prevented. Here is an illustration where the abuse of the local anesthetic, rather than the use of it, causes postoperative pain.

TYPE OF ANESTHESIA RULED OUT AS A FACTOR IN POSTOPERATIVE PAIN

We have come to a situation where we find that the public feels there is more postoperative pain following the use of a local anesthetic than a general anesthetic. In our experiments, we have found this to be an erroneous impression which can readily be dispelled from the public mind. This misleading popular view has gained ground through hearsay, that is, opinion passing from one person to another. For example, if a patient has to have a mandibular third molar removed, and he insists on the use of a general anesthetic in spite of our advice to the contrary, we learn that the reason for the patient's choice of the anesthetic is based on the fact that the last time he had a tooth removed with a local anesthetic, he suffered terrific pain. We naturally appear to yield to the patient's wishes, and promise to give him a general anesthetic. We proceed, however, to inject the area with a local anesthetic and explain to the patient that we are simply using suprarenin in the injection in order to control the amount of bleeding. When the area is anesthetized, we place the mask over the patient's nose and give him a few whiffs of gas and proceed with the removal of the tooth. The next day the patient will say how infinitely better it is to have a tooth removed with a general anesthetic because the afterpain is so much less compared to what he experienced following the use of a local anesthetic. Thus, we see that there is the mental condition with which we have to contend.

I have come to the conclusion that when a local anesthetic is properly used, guarding against the injection into the muscles, and limiting it to the area for which it is intended, carrying out the principles I have enumerated, the postoperative pain of which the patient may complain is due chiefly to the actual trauma instituted during the operation.

CHOICE OF PROPER SURGICAL METHOD A FACTOR IN POSTOPERATIVE PAIN

Regarding the actual trauma induced, I am of the opinion that possibly there is too much force employed in the technic for the removal of teeth. By this I mean that forceps are used to the exclusion of all other instruments. Of course, forceps are unquestionably preeminent as instruments for the removal of teeth, but they are not the only instruments. Take, for example, an instance where during the removal of a tooth the operator breaks the crown, and on examination finds that he is dealing with a dentine that is glasslike in consistency and will not yield to the pressure of forceps. Some other method must be employed in the removal of this tooth in order to avoid the destruction of the surrounding tissues and the resultant postoperative pain that is bound to follow. The oper-

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ator should resort to the surgical removal of this tooth by opening the area and removing the bone either by the surgical bur, chisel and mallet, or by hand force, whichever technic he is especially skilled in. In some of the cases, however, the tooth may be raised without necessarily disturbing either the outer or the inner layer of bone, by elevating the tooth in its own space. The spear-pointed elevator serves this purpose. The point of the elevator is applied on the mesial surface of the tooth, provided this particular case is a mandibular molar, and the mandible itself is used as a fulcrum. Postoperative pain can be avoided to a considerable degree if the challenge of these cases does not permit us to overlook a most important factor, namely, asepsis.

I should like to mention a precautionary measure in connection with the use of the surgical bur. Sometimes the operator fails to appreciate the fact that he is working on a patient who is under an anesthetic with the result that he uses the bur until there is the odor of burnt organic material before the bur is changed. This certainly produces irritation and is bound to result in considerable postoperative pain.

TREATMENT OF CONDITIONS OF POSTOPERATIVE PAIN

Of course, the treatment prescribed for postoperative pain depends upon the individual patient. I have not found any particular drug or treatment that has served the purpose for all cases. In the removal of third molars, where it has been necessary to remove the bone in order to release the tooth with the consequent traumatization of tissues, we have felt that something placed in the socket might minimize the discomfort to the patient during the abrupt change from the anesthetic effect of the tissues to their return to normal. To obtain this result we have lined these sockets with a dusting powder of a sedative nature. The following day the patient returned feeling fine. The next day, or several days later, to be more exact, the patient returned complaining of terrific pain. On examination, the socket appeared comparatively dry and devoid of blood. Having found this condition to occur in a number of cases so treated, we have come to the conclusion that although this treatment may aid in the immediate relief of postoperative pain, it serves as a sort of lining which, with the blood and saliva, obstructs the canaliculi of the haversian canals and thereby prevents the formation of a clot necessary in the healing process. To stimulate bleeding, it becomes necessary to irrigate this area with hot solutions.

Following the removal of mandibular molars, where the procedure has been comparatively difficult, we insert a small dressing of iodoform gauze in order (1) to prevent infection of the wound, (2) to keep the wound clean, and (3) to insure against any undue bleeding. The patient returns in twenty-four hours, and the dressing is removed. We then apply a solution of mallophene into the socket. Directly following this, we apply dry heat. Some patients have had immediate relief with this treatment, while others have not been benefited. On other occasions we find that the use of pyridium, applied into the socket, followed with the use of the Sollux lamp for twenty minutes, serves admirably for the relief of pain. We have experimented with rivinol (orthoform) or europhene, or both (orthoform 40 and europhene 60, with a white vaseline base). This has relieved some patients while others have had pain in spite of its use.

THE PREVENTION OF POSTOPERATIVE PAIN

Regarding the prevention of postoperative pain, a very vital step is taken when an attempt is made to prevent the ingress of saliva into the wound at the time of the operation. This can be accomplished through the application of sterile gauze sponges in the floor of the mouth. The patient should be cautioned against excessive rinsing of the mouth, which prevents the formation of a clot or washes it away when it has formed. At the completion of the operation I recommend placing a sterile gauze sponge over the socket, and advise the patient to close his jaw lightly on it and hold it in position for a few minutes. A clot will have formed in the meantime.

PHYSICAL THERAPY FOR THE RELIEF OF POSTOPERATIVE PAIN

When we find that we cannot relieve cases of postoperative pain with the use of the various drugs, we resort to the use of physical therapy. It is somewhat difficult for me to explain just how much good ultraviolet therapy does for these cases. It may possibly be likened to the person who wishes to get two weeks' worth of sunburn in an hour or two. The following day he suffers a severe burn. Upon the advice of one person, he applies one drug. The next day some one advises him to use a different drug. On the third day another person recommends still a different drug. All the drugs are of no avail. Then some one advises him to apply a new concoction, rub it in with ink, and tie it with a special kind of cord and place it outside his window. The following day, incidentally, the patient feels better and avers that that is the thing that cured him. He will recommend it to his friends for sunburn. This is merely to illustrate that in a great many of these cases of postoperative pain it is likely that they just reach the stage where nature has stepped in and brought about normal circulation and relief. The patient, nevertheless, maintains that the last treatment is the thing that gave him relief.

However, when the patient has had no relief from drug therapy, we resort to the use of the Sollux lamp for twenty minutes to a half hour. Patients are, as a rule, relieved. This is merely dry heat. We believe that this treatment serves the purpose of opening the vessels. In so doing it permits the blood to flow more freely to and from the affected area, carrying away the products of inflammation, and brings about a return to normal circulation. We follow the Sollux directly with the ultraviolet ray treatment from the Kromayer lamp. We administer ultraviolet energy locally by means of the crystal quartz applicators. These applicators are the means whereby the ultraviolet ray from this source can be applied in the oral cavity. The ray is usually applied two minutes directly into the socket, one minute lingually, and one minute buccally. Invariably the patient will feel relieved.

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ABSTRACTS OF
CURRENT LITERATURE

NUTRITION AND PEDIATRICS

By Samuel Adams Cohen, M.D., New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Acute Upper Respiratory Infection in Infants and Children. Samuel Adams Cohen. M. J. & Rec. **135**: Nos. 1, 2, 3, 1932.

Cohen takes up some of the more important facts and factors bearing on acute upper respiratory infection in infants and children. This disease is the most important and the most frequent single disease confronting the clinician today.

In regard to its bacteriology the author states that "even when an upper respiratory infection is present there is not necessarily an increase either in any special variety, or perhaps even in the total number of organisms." However, the causing agent of upper respiratory tract infection is in all probability a filtrable virus.

The symptoms of upper respiratory tract infection are in the main due (1) to mechanical obstruction of the nares which cause disturbance in breathing, and (2) to the toxemia of the infection. The constitutional symptoms may vary from very mild to very severe, and even alarming conditions are not rare. In regard to symptoms and signs of this disease, Cohen warns that these may be part and parcel of some specific infection like pertussis, measles, influenza, and the like.

Complication of this disease occurs by extension through the lymphatic system and by metastasis through invasion of the organisms via the blood stream. In the latter instance, the complications are more serious.

In regard to prophylaxis of acute upper respiratory infection, Cohen is under the impression that the incidence of respiratory infection could be reduced if more attention and thought were given to such factors as ventilation, avoidance of wet feet, and the item of clothing.

In his discussion on the relationship of vitamin A, the author states that although there is an abundance of experimentation to show that animals deprived of vitamin A are more susceptible to respiratory infections. Nevertheless he has not as yet been convinced that there has been any clinical proof that even a liberal intake of vitamin A is a means per se of preventing upper respiratory infections in normal, well-nourished infants and children.

The author noted that there seems to be no definite agreement among the many investigators regarding the true value of quartz mercury vapor lamp or carbon arc lamp irradiation and its effect on respiratory infections. Among the factors mentioned in his discussion on the prophylaxis of respiratory infec-

tion, Cohen states that the prophylaxis sometimes lies in the treatment of chronic sinus infection or removal of diseased tonsils or removal of infected or enlarged adenoids.

Cohen points out that in the treatment of acute upper respiratory infection, it must be remembered that the infection is usually self-limited. In regard to nose drops the author further holds that if the purpose of drops is to act as a local antiseptic, the effect is practically the same as it has been with chemical agents in the oral cavity, that is, that these chemical solutions are effective for a few moments if they act at all.

Furthermore, he quotes the work of Fox, who found that menthol as low as a 1 per cent solution caused degenerative changes, and menthol in a 5 per cent solution caused definite destructive changes of all layers of mucous membrane in the throat. The same detrimental effects of the mucous membrane were noted with the use of 5 per cent eucalyptus and 5 per cent camphor. However, Cohen believes because of its constrictive properties locally, two to five drops of 1 per cent solution of ephedrin or adrenalin or any of their compounds have been of benefit in many cases where there is a nasal obstruction.

Infective Asthma: Indication of Its Allergic Nature. Robert A. Cooke. A. J. M. Sc. **183**: 720, 1932.

Cooke of Cornell University Medical School states that there is no doubt but that bacterial infection of the respiratory tract may cause asthma of an acute and paroxysmal as well as of a chronic form.

Heredity has been shown to be important not as a cause but as a factor which may create in the offspring of sensitized antecedents, the capacity for or tendency toward that form of allergy typically exemplified by the seasonal hay fever form of pollen.

Along similar lines of clinical investigation Cooke is firmly of the opinion that asthma of infective origin appears to be subject to hereditary influence. Moreover the author holds that infective asthma may be regarded as an allergic reaction quite as properly as is the skin sensitive type, although the immunologic reactions in the two forms are not identical.

Diabetic Coma. Edwin Dowie. M. J. Australia **1**: 4, 1932.

In reviewing the cases of diabetic coma admitted to Alfred Hospital, Melbourne, Dowie found that most of these cases are due to (1) carelessness in carrying out instructions in regard to diet, hygiene and use of insulin, or to (2) some infection occurred complicating the diabetic state, or (3) sometimes there are cases in which diabetes developed rapidly until coma supervened, medical attention being then sought for the first time.

The onset of diabetic coma is usually gradual, and the commonest earliest symptoms are lack of energy, fatigue, anorexia, nausea, vomiting, or retching, headaches and vertigo. These symptoms become more marked, and the fatigue increases to drowsiness and later deepens into actual coma.

The author rightly states that diabetic coma is one of the most urgent conditions of medical practice, and every hour lost before treatment is commenced materially prejudices the patient's chance of recovery.

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Large doses of insulin, for example 50 units for adults, are to be given subcutaneously as a first dose in treating diabetic coma. Carbohydrates, in such form as glucose, and frequent and careful observation of the patient's blood sugar or urine are important factors in deciding whether further administration of insulin or carbohydrates is necessary. Warmth and fluids are two other important aids in combating the coma.

According to Dowie, unsuccessful treatment of diabetic coma may be due to (1) circulatory failure, (2) failure to respond to insulin because of infection or impaired circulation, and (3) renal failure which may result in absolute anuria.

Convalescent Serum in Prophylaxis of Measles, Chicken Pox and Mumps. William Gunn. Brit. M. J. **3708**: 183, 1932.

The contribution by Gunn on the use of convalescent serum in the prevention of measles, chicken pox or mumps is of interest. In regard to immune measle serum Gunn concludes that animal serum is clinically unsatisfactory and moreover contains an amount of antibodies which is both inadequate and insufficient to protect. On the other hand human convalescent serum gave consistently good results and is otherwise highly satisfactory. All injections of serum are given intramuscularly as soon after exposure to measles as is possible. To insure complete protection Gunn suggests that a minimum dose of 5 c.c. be given. From three years onward the dose is reckoned in cubic centimeters by multiplying the age in years by two. The protection rate of this serum varies from 94.2 per cent to 100 per cent, and the duration of immunity averages about a month.

The results obtained with the convalescent chicken pox serum indicate, according to Gunn, that it is far inferior to that of measles. According to the author's figures, as a result of the administration of chicken pox convalescent serum, the actual protection rate was 26.7 per cent.

In regard to Gunn's observation in the prevention of mumps with use of mumps convalescent serum, the author states that results are immediately unsatisfactory but justify a further trial of the method with large doses of serum.

Lead Poisoning in Children, the Cerebral Manifestations. Charles F. McKhann. Arch. Neurol. & Psychiat. **27**: 2, 1932.

Although the literature contains cases of lead poisoning in infants and children which have been traced to the prolonged use of lead nipple shields, or to the ingestion of water containing lead, or from face powder used by the child's mother, McKhann states that the most common cause of the ingestion of lead appears to be the habit of small children chewing paint from toys, cribs and woodwork about the house.

If this ingestion of lead paint continues for any considerable time symptoms of intoxication result. The most prominent early symptoms of lead poisoning are anorexia, constipation and colic; and in most cases these symptoms are associated with a varying degree of anemia. The most serious symptoms are those referable to the central nervous system, that is, vomiting, visual disturbance, delirium, stupor, coma, or convulsions.

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These cerebral manifestations of lead poisoning appear to be due to cerebral edema which results from deposition of lead in the brain, and the development of encephalitic manifestations is more frequent in children than in adults. Of the 40 cases of lead poisoning in children, which the author reports from the Infants and Children's Hospital in Boston, encephalitis was observed in 24 cases. There were 9 deaths in this series, and in those cases which have recovered, permanent injury occasionally resulted.

The author states that lead lines in the gums are relatively uncommon in children, but when present are good evidence of lead intoxication.

Of considerable value in the diagnosis of lead poisoning is the detection of a dense band found in roentgenograms at the growing end of the long bones or at the growing margin of the flat bones. According to McKhann, chemical analysis demonstrated that lead was present in these bands in several times the concentration found in the shaft. Moreover, the calcium was actually diminished in amounts indicating that in place of calcium, lead is laid down to some extent in these bands. It is interesting to note that the author holds that under certain circumstances, notably in the presence of an acute febrile attack or of severe acidosis, large amounts of lead may be released from the bones into the circulation and serious symptoms of lead intoxication may follow.

Removal of the lead, the so-called deleading, may be accomplished in some measure by induction of acidosis or of alkalosis or by administration of parathyroid hormone.

Because of the danger in children of aggravating the symptoms of lead intoxication by reason of releasing lead into the circulation, it is important to note that McKhann has abandoned this deleading process.

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EDITORIALS

Children

THIS again is the month of May, the month in the year which has been set aside to be devoted to the child, to his welfare, happiness, and general well-being. During this unusual period of world affairs, this era in which tremendous and unprecedented changes are rapidly taking place in all parts of the world, it is a good omen to note that the nation again considers it important to think about its children. Perhaps this may partly be due to the fact that the nation's thoughts are slowly but surely turning from things of a high tension, nerve-wracking character to more natural, less synthetic interests, and in the instance of child welfare no doubt much more important to the nation as a whole and to the country's future.

It has been pointed out previously in this column that orthodontists as a group are child-minded, that they are intensely interested in children. They enjoy the friendship and the confidence of, and are on a fraternal basis with, children. If these men did not enjoy the companionship as well as the confidence of children, they could not long remain engaged in orthodontic practice, because the work would become irksome, tedious and uninteresting; it would become a task instead of an occupation. Orthodontists with long years of experience have often been heard to say that it would be almost impossible for them again to do professional work for adults. This is obviously due to the fact that these men have become highly specialized through long contact with children, they have become tremendously absorbed in children, and if they were suddenly compelled to cater again to the whims and caprices of adults, they would find the change unattractive and difficult.

On the other hand, dentists in general practice have often been heard to say that they could not be even slightly interested in the practice of orthodontia because they would not want to work for children. The men who have this attitude toward children either are not child-minded or are laboring under the illusion that it is more irksome to practice dentistry for children than for adults.

Those who have worked with children in any line of professional activity are agreed that there is something fascinating, something pleasant and desirable about this work. The pleasant associations, atmosphere, and happy environment, which are natural attributes of child life, far offset any irksomeness or unpleasantness which may enter into professional work for children.

THE INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY has many readers who are definitely child-minded. They are, for the most part, men who are able to enjoy a boy with a dirty face, filthy hands, and a neck which is badly in need of either sandpaper or soap. They learn to talk to the boy in his own language; they know the lingo of the baseball lot, as well as the bluff pretense and the gusto involved in the threat of the mailed first. As for the little girls, these men learn to know and to enjoy their mental processes, to appreciate their seriousness and happiness. These so-called child-minded men, who over a period of years develop fraternalism with children, know the first symptoms of childhood's budding and blossoming into adulthood. Their interest is wholesome and sincere.

For all of these reasons, then, and for many more, orthodontists welcome with enthusiasm this nationwide interest in children's physical welfare. Orthodontists believe that the proper physical directing, guiding and nursing of the growing child, not unlike the care that the gardener gives to his rose, are one of the country's most important duties. After all, in considering the future of the nation, child welfare is more important than either balancing the budget or repealing the Eighteenth Amendment.

H. C. P.

Physical Orthodontia

PHYSICIANS are beginning to give much more thought and attention to the efficacy of a common and well-known therapeutic agent which is essential in the treatment of many ills to which human beings are heir. This remedy in the

past has been too generally disregarded. Fresh air, plenty of outdoors, sunshine, and exercise are highly important in the kit bag and in the armamentarium of any professional man whose duty it is to advise the public as to its physical activities and well being. These things are so much more important than are most nostrums that it seems almost appalling that their importance has not been stressed heretofore and that there has not been more said about the merits of the normal, natural things in this life.

The human race for many thousands of years dwelt out of doors or in caves. This was true for so many years and through so many generations that it is hardly reasonable to suppose that human beings of the present generation will submit peaceably, without some reaction, to the present imprisonment accompanied by vitiated air and unnatural surroundings forced upon them. Heart disease is on the increase. Living is on a high tension basis. Many vigorous, active and robust professional and business men either die or find their active life is discontinued by the time they reach the age of sixty. Therefore, life saving is becoming increasingly urgent and important. More thought is being given this question. We are realizing more and more the necessity for the benefit of human life of getting out and away from underoxidized and chemicalized air. We are realizing that habitual exposure to these unnatural conditions has its effect upon the body mechanism.

Medical men of long and varied experience tell us of dentists who work all day in a stooped position, straining their eyes, fatigued most of the time. They are often underoxidized; their nerves are starved for a kind of nutrition that they must secure to be normal, that is, the food of the oxygen in the air. Lacking this nutrition, individuals become irritable, nervous, constantly below par. More fuel is going out of than is being put into the machine. Too much has been said about food and too little about air as a nutritional and therapeutic agent. Air is a highly important element of nutrition and should not be overlooked in the study of nutrition.

Every parent knows that a child is better off in the country than he is in the large city. Breaking wood to burn on a camp fire, for instance, is more interesting and wholesome than breaking windows. Loafing by a camp fire is a wholesome and natural thing, and it just seems that human beings are expected to do it. On the other hand, loafing on a curbstone is synthetic and unnatural. It is much better for children to fight good, pure water with their hands and feet and learn to swim thereby, than for them to fight with the neighbors' children all day and learn nothing but hatred, disgust and animosity toward their playmates.

Men and women are no different from children in many of their actions and reactions. When men and women feel that all-gone, vitiated air, underoxidation reaction coming on, they should, temporarily, at least, abandon the softening influence of steam heat, moving pictures, synthetic gin, and emasculated cigarettes. They should revert for a time to the place from which they came and conform to nature.

Too much of anything is too much; the generation which indulges itself too much and too zealously in the pursuit of larger and softer overstuffed furniture, smaller and stuffier but more luxuriously furnished dental offices, smokier

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cities and other things, ad infinitum, will live to see the scar on its health and usefulness just as surely as life goes on, if it does not do something about it.

The modern indoor worker should rough it occasionally; he should try some of the outdoor sports of his progenitors. He will find it is a wonderful tonic but of no value whatsoever until after he has spent at least ten days in the preliminary conditioning process; up until that time it is a hardship. After that, a new and heretofore unknown world opens up like a dream described in a story book. The hands get harder, the eye gets brighter and clearer, the skin thicker. The world, after all (hard times notwithstanding), is a joyful place in which to live after such medicine.

If you are still young enough and it is not too late, get out of doors! Conjure with nature, whether it is winter or summer. Ask forgiveness that you never discovered this world before. Keep it up day after day, then watch the smile slowly creep back into your face and the light of enthusiasm for your work again burst into your life.

There must be an inspiration for everything. For years we have been reading about the ambitions of orthodontists and dentists to do something in no small way for humanity in general. It seems to be an obsession for professional men to write about it constantly. That is praiseworthy too, but as we grow older, we have only to look about us to note the increase in the number of physical wrecks among professional men in their forties and fifties to realize that many of these same men have not given a thought to their own physical well being until it is too late!

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BOOK REVIEW

Toothsome Topics*

Clarence O. Simpson, M.D., D.D.S., F.A.C.D., Professor of Radiodontia in the Washington University School of Dentistry, Director of the Oral Diagnosis Section of the Soper-Mills Clinic, St. Louis, is the author of *Toothsome Topics.*

Here is a publicly expressed tribute to orthodontia from an observing member of another specialty. "Nothing is more disfiguring to flaming youth than prominent ears and buck teeth. Obtrusive ears cannot be prevented but must be overcome by strength of character, but there are preventive measures for dental deformities." "Most dentists are negligent in recognizing indications for orthodontic treatment, and their advice should not be accepted when they suggest waiting for children to outgrow dental irregularities." "The cost of orthodontic treatment is controlled by the amount of time entailed and the degree of skill applied . . . . but under any circumstances the expense of correcting deformity is justified as a priceless heritage to children."

The above quotations are from an amusing and instructive little book written for the dentist's reception room. It answers the common dental questions in a sensible manner without injecting any radical opinions. Equally important and more unusual is the dignified wise-cracking style. There is a strain of humorous philosophy throughout the book which holds the interest of the lay reader as no other dental advice has done.

There is a great variety in the subjects of the twenty-four short chapters, and each of them arouses curiosity. Under "The Dental Cycle" is the following observation: "That the average survivor at the age of fifty must use decoy teeth when natural attractions are needed to capture another mate, and must exist upon a simple diet when affluence could be enjoyed with omnivorous abandon, is a romantic and gastronomic tragedy." "Which Toothbrush" is cleverly introduced with the sentence, "Most dentists who live to the age of indiscretion design a toothbrush as the crowning achievement of their professional career," and is concluded with, "After all is said and part of it done, more depends upon the brushers than the brushes." "How Vacations Affect Teeth" closes with, "See your dentist first is more charitable vacation advice than see America first." "Oral Hygiene on Sleeping Cars" is truthfully described by this pertinent statement: "The installation of lavatories for toothbrushing and retirement of the train hairbrushes were notable cultural advances which compelled passengers to use their hairbrushes but not their toothbrushes."

*The University Press, St. Louis, Mo.

Americans are so bombarded with sales propaganda that they will not read wholesome advice unless it is presented in an enticing form. *Toothsome Topics* is endorsed as a store of practical information, seasoned with humor, which leads the reader from chapter to chapter.

This is one of the very few books which has been written and prepared for the reception room of dentists. There are many chuckles within its pages for both dentists and laymen, and at the same time it is done in such a manner as to intimate no ridicule or reflection whatsoever upon the merits of the dental profession. The book should be on the waiting-room table of every dentist.

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NEWS AND NOTES

American Society of Oral Surgeons and Exodontists

The fourteenth annual meeting of the American Society of Oral Surgeons and Exodontists will be held in Buffalo, N. Y., at the Hotel Buffalo, September 9 and 10, 1932.

E. W. Browning, President,
921 Boston Building,
Salt Lake City, Utah.
Harry Bear, Secretary,
410 Professional Building,
Richmond, Virginia.

Southern Society of Orthodontists

The annual meeting of the Southern Society of Orthodontists will be held in Knoxville, Tenn., October 31, November 1 and 2, 1932.

George M. Anderson, Sec'y-Treas.,
831 Park Avenue,
Baltimore, Md.

Association of American Women Dentists

The eleventh annual meeting of the Association of American Women Dentists will be held at the Statler Hotel, Buffalo, New York, on September 12, 1932. A cordial invitation is extended to all women dentists.

Geneva E. Groth, Chairman Publicity
Committee,
1301 Medical Arts Bldg.,
Philadelphia, Pa.

American Dental Assistants Association

The Lafayette Hotel has been designated as headquarters for the Eighth Annual Meeting of the American Dental Assistants Association which will be held in Buffalo, New York, September 12-15, 1932. For further information address

Ruth M. Clark, General Secretary,
Suite 1-4, Scofield Bldg.,
Minot, North Dakota.

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Notes of Interest

Dr. Arthur W. Sobey announces the removal of his offices to Suite 1615-1616, 450 Sutter Street, San Francisco, Calif. Orthodontia exclusively.

Dr. E. V. Holestine announces his location at 4482 Washington Boulevard, St. Louis, Mo., for the practice of orthodontia exclusively.

Dr. G. Franklin announces the removal of his office to Suite 915, Drummond-Medical Building, Montreal. Practice limited to orthodontia.

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